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THE CANADIAN MEDICAL WEEK

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THE CANADIAN MEDICAL WEEK

HAMILTON

MAY 27—JUNE 1
1918

PUBLISHED UNDER THE AUSPICES OF

THE ONTARIO MEDICAL ASSOCIATION

"Every person into whose hands this Book comes is a Patriot. Many of us are not in khaki; the reason that keeps us comfortably in Canada, while our country calls, are various. Although the reasons of each satisfy his own conscience, they do not excuse him from devoted patriotic effort at home. It is our duty to study our own Problems. Be prepared to carry on."

—From the Official Programme.

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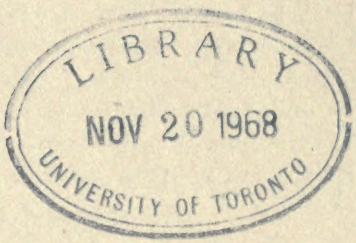

PRINTED IN CANADA

In Memoriam

"The World will not willingly let die the names of those Patriots who, in her different ages, have received upon their own breasts the blows aimed by insolent enemies at the bosom of their Country."

List of Graduates and Undergraduates in Medicine of the Canadian Universities who have paid the Supreme Sacrifice on Active Service in the present War.

University of Toronto

D. B. Bentley
G. H. Bowlby
R. H. Bonnycastle
T. G. Brodie
J. A. Callum
A. P. Chalmers
A. C. M. Cleghorn
G. W. Crow
W. G. Coutts
G. G. Duncan
W. L. Evans
P. A. Gillespie
E. R. Gilmer
G. C. Gliddon
A. R. Gordon
James Henderson
William Henderson
R. Home
R. Horkins
F. C. Howard
R. A. Ireland
Herbert Jones
John McCrae
J. W. McDowell
W. W. McKenzie
W. S. McKeough
D. B. McLean
E. H. McVicker
I. B. Marty
H. S. Monkman
H. H. Owen
M. H. Paterson
T. W. P. Peacock
M. Rae
R. E. Rivers
R. S. Smith
E. Z. Stirrett
A. W. Tanner
C. E. Thompson
S. A. Walker
N. J. L. Yellowlees

List of Graduates and Undergraduates in Medicine of the Canadian Universities who have paid the Supreme Sacrifice on Active Service in the present War.

McGill University

J. K. Bertram
J. S. Brown
R. P. Campbell
L. E. Clarke
M. C. DeRochie
W. P. Dillon
J. L. Duval
A. M. Fisher
S. W. Hewetson
J. LeR. Mavety
C. S. MacKenzie
S. A. Ross
C. B. Tinling
F. S. Walcott
J. P. Walsh
D. Waterston
H. B. Yates

Queens' University

John Carmichael
H. Ramsay Duff
Harry L. Jarman
William Manning
Thomas W. F. MacKnight
Alvin Edmund Wartman

Dalhousie University

Raymond Stewart Fraser
Kenneth Angus McCuish
Walter Leonard MacLean
Neil Archibald McLean
George MacDonald Sylvester

University of Manitoba

St. Clair Dunn
James B. Haverson

Western University

A. V. Becher

IN FLANDERS' FIELDS

In Flanders' fields the poppies blow
Between the crosses, row on row,
That mark our place; and in the sky
The larks, still bravely singing, fly,
Scarce heard amid the guns below.

We are the dead. Short days ago
We lived, felt dawn, saw sunset's glow,
Loved and were loved—and now we lie
In Flanders' fields.

Take up our quarrel with the foe!
To you from failing hands we throw
The torch. Be yours to hold it high;
If ye break faith with us who die,
We shall not sleep, though poppies grow
In Flanders' fields.

—By John McCrae, Lt.-Col. C.A.M.C.

INTRODUCTION

In offering this volume to the medical profession of Canada, the Ontario Medical Association has been prompted, partly by the request of a large number of physicians throughout the country and partly by the belief in the minds of many of us that a step forward in the field of medical literature in this province should be made, and that no better opportunity could offer than that of publishing the many papers and discussions submitted at the recent medical congress held in the City of Hamilton.

It was a happy thought, indeed, which brought together, in one splendid gathering, physicians from every province in Canada to take part, together with our valued colleagues from the United States, in the presentation of papers, and in the discussion of the various topics therein contained.

To those gentlemen from the south of us, who came so willingly to assist, we offer our sincere thanks and trust that, though national ideals may separate us politically, no barriers may prevent us meeting together for the discussion of those measures which will be for the advancement of our chosen profession.

We believe that this volume, while it is commemorative of the splendid meeting above alluded to, may also be, in a small way, a memorial to those of our number who have heard the call of Empire and have unselfishly laid aside their work here that they might answer that call, and still more to those heroes who will not return, but have given their lives in the defence of a civilisation so dear to us all.

"Take up our quarrel with the foe!
To you from failing hands we throw
The torch. Be yours to hold it high;
If ye break faith with us who die,
We shall not sleep, though poppies grow
In Flanders' fields."

Are not these words of a dead hero of our Canadian profession particularly applicable to us? Is there not a challenge here to those who, for various reasons, are compelled to carry on at home, to

prosecute with renewed vigour the investigation of scientific truth and, forgetting whatever boundaries may divide us, seek by every means to build up in this virile land a profession nation-wide in its compass, universal in its thought, and worthy in every way of the best traditions of the great body to which we belong.

G. STEWART CAMERON,
President, Ontario Medical Association.

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PRESIDENTIAL ADDRESSES

CANADIAN MEDICAL ASSOCIATION

H. B. Small, M.D., Ottawa, Ont.

Abridged

As the subject of my address, I have selected the proposed revision of our by-laws, which has been submitted for consideration during the ensuing year. My purpose is to point out the more important alterations, and to this add some general thoughts and suggestions upon the aims and objects of our Association.

Last year we celebrated the semi-centenary of our foundation. During the first forty years we followed the original set of by-laws, with very little change, meeting each year in the various large cities with addresses, papers and discussions, as at present, and occasional resolutions and reports of committees. The finances were maintained by a levy upon members present at the meetings, the sum of two or three dollars being ample to meet the cost of printing, stationery and postage, which was the limit of expenditure during that period of association life. From the very first the annual meetings were a success. The best men throughout the country were personally interested, and wherever the meetings were held they received the hearty support of the local members of the profession.

In 1908 our present by-laws were adopted, and an entire change made in the policy and work of the Association. It was then we made that important step—our affiliation with the provincial associations; also an annual fee was imposed upon all members and the publication of the *Journal* was begun.

These changes were not due to any sudden inspiration, but they had been gradually forcing themselves upon the notice of members. The membership had greatly increased, the attendance at meetings had doubled and trebled, and it had become evident that a more active and responsible course must be pursued. Probably that which had the greatest influence in promoting the change was the opening of the

Western Provinces, and their assuming a provincial status. This placed all health and medical affairs under their jurisdiction, and then quickly followed the formation of Provincial Medical Associations, which with the characteristic energy of the West, immediately became representative and influential bodies, and completed provincial organizations throughout Canada.

A changed environment for our Association then prevailed, and, as the parent society, our responsibilities were realized. We became the central connecting body, binding all together, and with the enthusiastic support and affiliation of all the Provincial Associations, our new constitution was established. We launched from the placid course we had been pursuing upon deeper and more troubled waters.

From that period there was established the important relations of the Canadian and Provincial Associations that now exists. Each has its own special sphere of work, under the control of the Provincial Legislatures in matters relating to the medical profession within its boundaries, public health, medical education, medical legislation and much of the same character. It is proper that the profession within the boundaries should look after such affairs. It is for us to bring together representatives from these various centres and offer opportunities to meet and discuss and compare their efforts. There is also a distinct and definite field of work for us in considering questions of Dominion-wide importance. Immigration, statistics, military matters are all under the control of the Federal Government and are for us. Our work is harmonious; and we have learned that we are inseparable. Either one cannot continue effectually without the other, whilst combined we become a force, which, if properly and carefully conserved, should be irresistible when brought to bear on matters of public interest.

Although the constitution we adopted has served our purpose in a remarkable degree, during the ten years certain amendments and additions have been made from time to time, many details have been found inefficient, and experience has shown where improvement in our procedure may be effected. The Ontario Association is now in the process of promoting a thorough reorganization, and it would seem a proper occasion for us to consider and reset our own by-laws. It will be found that no radical change is proposed, but there are certain alterations that must be carefully considered.

Grant that our ideals are attained, that our organization is complete, our executive and committees working efficiently; is our work to cease? Are we to be content with the annual gathering, and our interest to lapse for another year? Are we to rest satisfied with

papers and reports presented by others, and take no part in promoting the work of our Association? Its success and standing, the quality of its work and the influence it exerts, is dependant upon the individual members; to their personal interest in the routine work, their knowledge of the subjects under discussion, and their ability to take part with an earnestness and power founded upon a thorough knowledge.

I would make a plea that our attention be not limited to simply medicine and surgery, but that it should range into the many allied subjects of sociological interest that rightly are part of our work. It is sufficient to mention public health, food, housing problems, parental and maternal care, the mental, tuberculous and venereal plagues. We may allow that these matters are better worked out by other bodies, comprising lay as well as medical specialists, but each subject will be better presented to the outside world if discussed among ourselves from a purely professional standpoint.

It is one of our proud boasts that the profession of medicine is something more than a money-making vocation; that our ideals are high—that our daily life and service are toned and softened by their influence.

The training received during the study of medicine, the independent, untrammeled yet busy college life, crushes petty foibles and broadens the outlook upon life. Added to this the experience gained by years of practice, and there results a wealth of wisdom generally neglected and too often unrecognized. It follows that upon the many questions of national importance that are before the public, the members of our profession are but fitted to advise. Untrained laymen, earnest in their endeavours, are struggling with these questions and turn to us for help and advice. Governments have enacted laws for our benefit, many privileges have been accorded the profession, and in return there is imposed upon us a duty and a responsibility to our fellowman and to our country.

The same obligation falls upon us as a corporate body, and this phase of our work has been sadly neglected. We have not recognized the importance of our Association and have failed to place it in the position it should occupy in the national life of Canada. As the representative body of the profession it is its duty to offer an opinion upon these public questions that should be final. Its pronouncements should be sought for, not only by the public but also by authorities and by governments.

In these changing times—and in the greatly changed world that is to follow this war,—many weighty and vexed problems will have to be solved. The onset of the war found the country unprepared.

Will its termination find us equally unprepared for the future? Many may be satisfied to leave the burden upon those in authority, but the responsibility rests, in a certain degree, upon each citizen of this country, and to each falls a share in the moulding of what is to be. The more varied his opportunities, the greater his ability to lead; just so much more must he respond to the call of duty. The financial, commercial and labour forces are preparing for the change, but the sociological problems are not as yet properly touched. It is here that the views and opinions of the profession of medicine will be most valued, and the influence of the individual member makes him one of the strongest forces in forming public opinion. The principles of national efficiency are now being fully appreciated. The public is beginning to realize that many of the pet fads, which in the past have fitfully interested the well-meaning, are really of the greatest importance in the upbuilding of our country.

The last few years have taught us that all in Canada are not Canadians in sentiment, as well as in name. Foreign views are prevalent and plentiful. The simple, healthful views of life, that we like to think of as Canadian, are in danger of being lost in the mass of imported life from the dregs of Europe. America cannot assimilate the foreigner in such vast numbers. With the close of the war there will be a rush to this country—particularly from the oppressed and persecuted nations. Their morals, their diseases, mental and physical disabilities are for us to be familiar with, and against which to raise a note of warning. To add to this condition, we are depleting the country of its best element. There would seem to be something wrong that drains our universities and our offices, and places the most intellectual in the trenches and the forefront of the fray, whilst so many strong and robust but devoid of patriotism and devotion, the dishonest as well as the defective, remains at home, to be the fathers of the coming generation. As bearing upon national efficiency it would be well also to consider the effect of enlisting only the unmarried. It would seem more proper that for every life offered for his country there should be some offspring to perpetuate the bravery and patriotism of the parent. The question of increasing the native-born will have to be considered in the near future. It is receiving attention in all European countries, it is being seriously discussed by governments, and received the attention of our Senate during the past session.

These and the many other questions of social and national importance should be carefully considered by every member of our profession. They are of importance now and will be still more so at

the close of the war, and he is wise who has carefully thought upon them, weighed them and formulated his views. The Government in every country is carrying a load almost beyond endurance. The national life is in their care, the misery and suffering of the people, and the danger from without that threatens must wear upon the heart and brain of the bravest and the noblest. When to this is added the petty fault-finding and carping criticism that is too prevalent, one wonders at what mortal mind can stand. All authoritative bodies from the highest to the lowest, as well as the many societies and associations, striving for the public good, require the advice and support of all possessed of special knowledge or technical ability. Even the highest government of the land will welcome aid and suggestions to enable them to grapple with the momentous questions of the day.

His Excellency, in his very suggestive address, in opening this "Medical Week" touched the keynote that has prevailed throughout, when he advocated and urged National Service for all. Upon none does it fall with greater weight than upon our Association, whose whole aim and object is the promotion of National Efficiency.

ONTARIO MEDICAL ASSOCIATION

MEDICINE AND DEMOCRACY

JOHN P. MORTON, M.B., F.R.C.S. (EDIN.), F.A.C.S.,
HAMILTON, ONTARIO.

Exigencies consequent upon combining five medical associations into one great congress and consideration for the scientific programme have led to the suggestion that the president's address be distributed rather than read at the meeting. My purpose will be to discuss certain problems, actual and prospective, confronting our profession today, and, if possible, to suggest solutions therefor.

Permit me to express my deep gratitude to the association for conferring the presidency upon me, for I know there are many others more gifted and more deserving of this honour. I have been singularly fortunate in having the advice of men experienced in the work of the association and a support from our local profession, highly unselfish and praiseworthy.

The thirty-eighth annual meeting is both unique and unprecedented. We have united all the large medical associations of Canada into one great Canadian congress, to be held in Hamilton during this war year. The desire for this unity and conservation of energy by all the associations was early noticeable, and following an invitation by the Ontario Medical Association, a conference of representatives from the Canadian Medical Association, Ontario Medical Association, Canadian Public Health Association, Ontario Health Association, and the Association for the Prevention of Tuberculosis was held at the Academy of Medicine, Toronto, on October 25th, 1917. The spirit of coöperation between the participating associations was very evident, and, without difficulty, amicable arrangements were easily arrived at for the congress under the auspices of the executive of the Ontario Medical Association. The necessary conferences between such important bodies in anticipation of and in preparation for the meeting in May have been very helpful, and augur well for the future organisation of our profession, if any action, defensive or constructive, may be contemplated. My deepest concern is that this congress, which is a new departure, and for which I must consider myself partly responsible, will commend itself to the profession from the standpoint of its scientific programme and

will engender the spirit of coöperation among the different associations. If these objects are attained, may I express the hope that this precedent may occasionally be followed.

The logic of holding this congress seems so apparent to some of us, that it is almost superfluous to answer some quite honest criticisms to which the proposal has been subjected. Some have said that no meeting at all should be held during such a strenuous war year, but I must conscientiously differ from this opinion for an essential part of war work is to meet and understand the vital questions at home, and our profession at this time, both from the standpoint of its own good and from that of the welfare of the public, is confronted with some strikingly important problems. The report of the Royal Commission on Medical Education has been tabled, and the future of regular medicine in Ontario requires the immediate attention of our association in shaping and carrying through a resultant government measure. Further, it becomes necessary for us to decide how we can be of use from a purely lay point of view during war times, and this is quite apart from the splendid record of our profession in the work of the Canadian Army Medical Corps. Again, it becomes necessary to consider the pending problems involved in the gradually changing relations between the medical profession and the State, for these may result, in the not distant future, in the enactment of a health insurance bill. These are sufficient reasons for the congress, but if any further justification were necessary, it might be found in the fact that we have committed ourselves to a scheme for the reorganisation of our profession in Ontario on the basis of the county societies, and it is fundamental to the success of this plan, not only that a meeting be held, but that a large representation be induced to attend from rural districts. We have been told that separate association meetings would be more stimulating and would benefit the several sections in which they were convened, but surely the great need for conservation of time and energy is a satisfying answer to this criticism.

Permit me, with pride, in the early part of this address, to indicate the increasingly onerous part taken by the medical profession in the great world war. The Ontario profession has been greatly honoured and grandly represented by about twenty per cent. of its members who have joined the Canadian Army Medical Corps, and we are very proud of those who, at great personal sacrifice to themselves, have crossed the ocean to accept whatever appointment might fall to their lot, and in many cases to risk their lives for their country. Above all, will we enshrine in memory our heroes who have given their

lives at the call of duty for the defence of country and liberty, and as Sir Berkley Moyinhan has so well said: "Let us write the epitaph they would most desire—'they have played the game'," than which there is no higher meed of praise. The awful necessities of this terrible struggle exhibit human nature at its best, and, unfortunately, at its worst, for our Old World has never witnessed a sadder paradox than this, that the greatest scientific geniuses are seen planning human destruction and then passing on the wrecks they have made for reconstruction to geniuses just as great. Happily for our profession, this work of reconstruction largely falls to our lot, and our only desire is that it shall be well and faithfully performed.

If this meeting of the Ontario Medical Association typifies any special idea, it is reorganisation. For long, the progressives among us have recognised that unity has been sorely needed between the many medical clubs, societies and associations of Ontario. Uniformity of purpose and desire have undoubtedly been in evidence, but an absolute lack of organisation for the attainment of these objects has been still more in evidence. At the Toronto association meeting not more than an odd hundred would register from the remainder of the province. When the weight of a united profession was required to exercise its justificable influence on the authorities concerned with framing a medical bill which would decide the standing of our profession for years to come and define the protection that the public might legally expect from exploitation by charlatans, those interested found the necessary initiative woefully absent and could discover no means whereby the medical voice of the province, though unanimous, could assert itself. Our own association which should have, and did finally move in this matter, represented only four or five hundred of the three thousand practitioners. In marked contrast to our criminal want of organisation, the irregulars, in their presentation of evidence before the commission, fought as one man and employed the most effective legal talent. Our negligence, where the medical welfare of the public is so vitally concerned, is unjustifiable and for years much medical charlatanism has been made possible, because years ago, when this question was originally dealt with by our legislature, the same spirit of professional lethargy was abroad. These facts and many others have spelled lack of efficiency and have rendered absolutely necessary a radical change in organisation. A carefully selected committee has drawn up a new constitution and by-laws; these were adopted by our association at a representative meeting on October 25th last, and our gathering this year is notable as being the first held under the new regulations. We confidently

expect, by these regulations, to be enabled, in a more comprehensive and effective manner, to serve the public and the State. In this departure our committee has wisely accepted the successful precedent of the Americal Medical Association. The guiding principle of the new constitution is to render the province a unit by adequate organisation, and this is well accomplished by giving the county societies proportional representation on a committee of general purposes which will be the governing body of the Ontario association. The ethical standards also rest with the local bodies, for only their members in good standing may join our association. Democracy is thus applied to the organisation of the medical profession, for the parent provincial association now really voices the medical opinion of the province, as our registration contains theoretically every doctor in the province. To render this representation vital and actual, each local society must be active and speak authoritatively for its own district. To bring about this desirable state I would suggest that we again follow the example of the American Medical Association and appoint councillors, who, in groups of possibly three, might be placed as advisors for and supervisors over the societies in certain territories, helping to arrange meetings and to make available good material for programmes. Moreover, they would assist in establishing societies in unorganised parts and would be required to report to the association for their respective districts. To the extent that local societies are not representative and that localities are unorganised, or, if organised, are inactive, to this extent does our association, under its new constitution, fall short of its ideal. I am speaking of the question for Ontario, yet it is devoutly to be desired that this plan for reconstruction be applied to the whole Dominion. Contemplate for a moment the splendid position of our Canadian profession realisable by the consummation of this scheme. Every district would have an active local society, and these bodies, through proportional representation, would control their respective provincial associations, which they would unite to form. These provincial associations, in their turn, would unite to constitute and control the Canadian Medical Association. This complete system, already partly in operation, would reflect the democratic spirit of the times and would function defensively and constructively for the highest good of the profession and the public. We would secure much greater concentration of influence, more unity and definiteness of purpose, better uniformity in our ethical and educational standards, a marked improvement in coöperation between our local societies and associations, and increased attendance at our meetings. Our association is deeply indebted to

those of our members who have not only dreamed of this new order of things, but have been instrumental in its realisation.

The Royal Commission on Medical Education, after numerous sessions, at which every opportunity for giving evidence was afforded, has printed its findings, and, although we purpose to argue in committee many points which seem unsatisfactory, we have, on the whole, reason to be pleased with the report. The commission recommends that the care of the sick be in the hands of the medical profession, and that any one to whom the province gives this important privilege, must have at his disposal the available knowledge on all subjects pertaining thereto. Certainly the only manner in which we can effectively answer and counter the claims of the irregulars is to incorporate in our own teaching system all the therapeutic measures which have proven themselves beneficial. The report insists that we have been somewhat prejudiced and that physico-therapeutics must form a more prominent part of our teaching, and that an adequate staff and apparatus be provided for this purpose. Someone has said that "Convicitions are more dangerous to truth than lies," and we have probably been too sure that our system has covered the whole field of treatment. The history of the wonderful changes in therapeutics from Hippocrates to these times persuades us to keep our minds open for suggestions from whatever source. William Harvey's first publication, "Motions of Heart and Blood," was unable to pass medical censorship for twenty years after it was written. Renouard says that medical men of his day considered Harvey demented, and that he lost most of his practice, in spite of the clearness and method with which he developed his ideas. Lord Lister's fight, extending over years, for the recognition of the principles of antisepsis, is still more impressive. Without contradiction one may say that prejudice, doubt, and active opposition have been the outstanding characteristics of the fate of really valuable new medical truths. Next to the antagonism of the church, probably our own prejudices and conservatism have been the worst barriers to progress. The royal commission was right in this criticism, and it behooves us for our own welfare and the welfare of those in our charge, to keep minds open for the consideration of even apparently heterodox treatment. Our teaching bodies should be especially alert, and might include a progressive medical committee for the testing of even accidentally suggested therapeutical methods. Next winter a bill, based on this report of the royal commission, will come before the legislature, and because our cause is just and we are in a position properly to present it, we are hopeful that the measure in its final form will do

our profession full justice. Certainly it would be unworthy of us to gain control over the health of the community by organisation, lobbying or other political device, unless we conscientiously strive to maintain the highest possible standard of efficiency.

I feel called upon in this address to introduce certain other considerations which seem to me of vital importance for the welfare of our profession and of the public whom we serve. "Service" is the best and most significant word in the English language to-day. Consideration for others is certainly the avowed ideal of sane modern democracy. The stupendous world conflict, in which at this moment great armies are advancing and recoiling, with the result wavering in the balance, will decide whether the German point of view is to stand or fall, that might is right and that the weak have only the privilege of servitude. The application of this saving principle of service to our profession raises the question whether in simply caring for the sick we are fulfilling our whole duty to the public. From my view point, our medical associations, societies, clubs, and round tables should not be for self-betterment alone but should actively engage in the great service of medically educating the laity. No government cares to enact laws without the support of public opinion, and it is equally desirable that we should secure effective lay coöperation by education before seeking general support for the many great public health movements. Our health officers may enact all manner of legislation, but, until the public wittingly coöperates, these will largely fail to obtain the desired prevention. If then our organised profession is to live the larger life of service, it must use its organisations for public education. But my appeal is also to the individual physician to expand his sphere of usefulness by using his wonderful opportunities to inculcate the accepted principles of prevention and cure of disease. Few of us now act on the old-fashioned notion that the doctor should like the Asclepiadæ in the old mystical days of healing, surround himself with an atmosphere of mystery, which too often is but the cloak of ignorance. You will not interpret this to mean that the patient should be fully informed of his disease, but there is no reason why the physician should not be a medical missionary of education, and thus fulfil the modern democratic principle that we should think in terms of our neighbour. The greatest service then that our organised profession and the individual physician can render the public is to educate them medically to a reasonable extent. This would strengthen the hands of our public health officers, for enlightened public opinion in such problems as the venereal diseases and tuberculosis would help and force our legislators

to keep pace with it; we ourselves would be stimulated to maintain higher standards both in teaching and ethics, and further, the public generally would not so easily become the dupes of charlatans, who would then be rated at their true value.

Another consideration to which I would invite your attention may be put in the form of a question. Do we as a profession, in the great responsibility entrusted to us, adopt adequate means for safeguarding the public from incompetency among ourselves? Do our recent graduates possess the very highest possible standard of theoretical education and the practical knowledge necessary to treat and operate for disease? In too many cases, I fear, they acquire at the expense of their private patients, their practical knowledge, which should have been gained in some hospital. This might be prevented by greater teaching efficiency and by improving the facilities for clinical and practical instruction. Full-time professors in at least medicine and surgery are essential. Again, after a man has been in practice for a number of years and makes no attempt to keep in touch with modern ideas, he becomes educationally mired and is a medical menace in his community. Unfortunately this type of doctor often learns ways of beguiling the public as fast as he unlearns his medicine. Can the public be protected from this danger? Some have suggested that we all undergo periodical examinations to be conducted by the whole-time men at the teaching centres. Even classification of practitioners, perhaps every seven years, has been mentioned as a help. A more practical expedient would be to require each one to undertake post-graduate work at specified times, and proper facilities for this would then be obligatory upon all university and hospital centres. Moreover, all teaching bodies might be able, through local societies, to provide courses of extension lectures.

This seems a suitable juncture to mention the very commendable propaganda on the part of the American College of Surgeons for standardisation of hospitals on the basis of efficiency. Taking into consideration the various conditions under which hospitals operate, certain requirements would be laid down, and according to the degree to which these requirements are fulfilled, would the hospital be classified. The factors named as imperatively essential are, the keeping of good case records and the utilisation of these records as tests of efficiency; the maintenance of proper laboratory facilities; and the presence of a staff with good character. In the bulletin issued in March of this year by the college, these three requirements of a minimum hospital standard are stated as follows:

Case Records. That the hospital keep in a systematic manner case records of its patients together with a convenient summary of

each case; and that it utilise these records in analyses of its medical and surgical efficiency.

Clinical Laboratories. That as implied in the foregoing requirements concerning case records, the hospital provide either directly or indirectly, the laboratory facilities, which in the science of medicine are essential in the diagnosis and treatment of patients admitted for care under normal conditions.

Division of Fees. That the hospital trustees or governing authorities in coöperation with the staff take action definitely to prohibit from all services of the hospital the practice of division of fees.

Although these considerations are accepted by the committee as a minimum for testing hospital efficiency, the various hospital staffs are requested to consider other features of the work, which, in their judgment should become part of the standardisation programme. These are the training of internes, the training of nurses, obstetrics, pediatrics, cross infections, diatetics, anæsthesia, intelligible financial accounting, hospital administration, and pharmacy.

To safeguard the welfare of the public, then, the highest standard of hospital efficiency is necessary, for the people now look upon this service no longer as a luxury but as an inherent right. The regents of the American college believe that a proper accounting in hospital work is inevitable, and that if the initiative is not taken by the profession, it will, as has been done in some case already, be taken by the public. The better to safeguard the public from inefficiency among ourselves, I would add the following requirement to the criteria of efficiency noted by the regents, viz. that all hospitals be properly equipped for post-graduate studies.

Among prospective problems may be placed the future relation of the medical profession to the State, which is claiming more and more attention in all countries. We are experiencing great democratic changes and are informed that still greater upheavals will occur after the war. Our profession may soon be required to formulate some plan whereby the poorer and more medically neglected sections of the population will have the right and privilege to ask for free medical or surgical care. The cost of this so-called health insurance system would be divided between the patient, the firm, and the government. Hospitals and other properly equipped diagnostic centres would be established, where all necessary examinations for arriving at correct diagnosis would be carried out. The greatest gain of this plan would be the abolition of charity work, the very name of which has a stigma attached to it. Gladstone has said that we must do away with all charity, for we are sorry when we dole it out and we are sorry when we withhold it. Patients under this

scheme would feel entitled to a physician, to a nurse and to the necessary medicaments. Of hardly less benefit would be the wonderful opportunities offered for scientific social work, for the presence of trained nurses in any of these homes would be a wonderful educational factor in cleanliness, and, let us hope, in godliness. Medical assistance would undoubtedly be called earlier with a consequent prevention of much disease and curtailment of many epidemics. There would be required some system of referees to assure efficiency and to prevent men lowering themselves to lodge practice methods by abuse of the system. The experience of all the other countries which have tried this plan of health insurance should enable us to evolve a very satisfactory act. Whatever the future may hold for us in this regard, thanks to the reorganisation of the profession, we are not likely to have a measure of this character enacted without thorough consideration by the medical men whom it most concerns. The medical profession can be proud of its record through many centuries, and it is to-day the only one which offers its services without cost to thousands in every city in the world. Now, although this is highly unselfish, and although we have been thoroughly conscientious in the performance of this work, it is justifiable to enquire, if, in the light of modern social service investigation, we are wise to continue this form of charity. Carried to the excess which is necessary in looking after the great dependent sections of our communities, it leads to a sense of superiority on the part of the donors and to a reprehensible pauperism of the recipients. Our social service scientists tell us that in so acting we are dealing with the evil from the wrong standpoint. Rather should we coöperate with the laity in initiating and furthering all movements which will tend to prevent disease. We are advised to be foremost in working for all child welfare organisations, for propaganda against venereal diseases and tuberculosis, for all public health work and other educative schemes. Our heartiest support should be tendered to all properly organised community centres and playgrounds, and in a word for all social service enterprises.

In bringing this address to a conclusion, permit me to express the same hope as did my immediate predecessor that before this association again convenes, the awful world-convulsing war will be finished and that the principles of liberty and democracy will have triumphed. It is gratifying to know that in the work of reconstruction which this war makes necessary, the medical profession must take a large and noble part, for whatever change there be in the spirit of the age, it cannot sound a more inspiring watchword than ours—*Service.*

SECTION I

EYE, EAR, NOSE AND THROAT

THE MANAGEMENT OF SIMPLE GLAUCOMA AS SIMPLE ANTERIOR AND SIMPLE POSTERIOR GLAUCOMA

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I shall not attempt to classify the various types of glaucoma, nor to discuss the characteristics of the different forms of the disease. But rather speak of some of the clinical manifestations of the simple, non-inflammatory type with the idea of classifying them in order to assist, if possible, in determining the best mode of treatment to follow in the individual case. Usually the type of the disease only has been the guiding factor in determining our operative procedure, the variety of clinical manifestations in the same type of glaucoma being neglected.

There are many things we do not know about glaucoma. A few clinical facts, however, stand out clearly in the experience of every one who has studied carefully any considerable number of these cases. For instance, it can be stated that there is no direct relation between the tension of the eyeball and the depth of the anterior chamber. While the chamber is shallow in the majority of the cases, it not infrequently happens that although the tension is high a moderately deep chamber will persist. Again, one cannot state definitely the tension of the eyeball that is pathological for all cases. That is, the upper limit of the normal tension is a variable quantity. Farther, there is no definite relation between the tension of the globe as determined by the tonometer and the contraction of the visual fields. One case with a slight rise of tension will show deep cupping of the nerve head and serious loss of visual acuity, while another with higher tension over a long period of time will still retain a surprising amount of vision and fairly full fields. I have no definite knowledge on the relation of the fields to the duration of increased tension of different degrees. The

resisting quality of the tissues involved will ever offer an indeterminate quantity and make the problem most complicated.

Another fact that stands out clearly is, while many cases of simple glaucoma are relieved after an iridectomy has been performed, others are not improved, and a few are made worse.

In the determination of whether or not a case it doing well the field of vision for colours, and, especially, for form offers our best indication. The tension, however, as determined by the tonometer should be taken at frequent intervals in every case, and offers an indication as to whether or not we may expect from the treatment an improvement in the field of vision. In late cases the visual acuity may offer some guide, but the vision may remain quite normal until the case is far advanced. It is dangerous to rely on the diminished tension alone, as one never knows the minimum tension that may be pathological for the particular case. Diminished tension must be accompanied by visual fields that shows improvement, or at least are not deteriorating, before one can be satisfied that the process is not progressing.

Before being subjected to any operative procedure, eyery case of simple glaucoma should be giyen a thorough course of general treatment, together with the local use of eserine or pilocrapine. All refractive errors should be carefully corrected.

The fact that an iridectomy at times gives a result that is perfect surgically, and leads to the complete relief of the increased tension, while at other times as equally skilfully performed operations will be unsuccessful, leads to the natural conclusion that if the cases could be properly selected, the iridectomy would be successful in a much larger percentage of cases. On the other hand, the trephine operation, as developed by Colonel Elliott, of London, England, frequently succeeds in a class of cases which heretofore has been unsuccessfully treated by other methods of procedure. If, then, we can so classify our cases clinically as to enable us to select the group which is relieved by iridectomy or other operation based on freeing the anterior lymph system, and those best suited for trephine operation, it would offer a definite mode or procedure and possibly lead to the best average results.

For the past four or five years I have attempted to clinically divide all cases of chronic non-inflammatory glaucoma into two groups, (1) anterior glaucoma, (2) posterior glaucoma. The classification is based upon whether the anterior or posterior lymph system is more seriously involved. Granting that the increase of tension in the eyeball is due to the retention of fluids which normally have two sources of outlet,

one through the anterior lymph system through the spaces of Fontana and the other through the posterior lymph system in the superchoroidal space around the choroidal vessels and optic nerve. If the anterior lymph spaces are blocked, there will be a tendency for the excessive fluids to flow backward, thus tending to hold the lens and iris in its normal position, or at least preventing an entire obliteration of the anterior chamber. If the posterior lymph system is involved and the normal outflow maintained through the anterior lymph system, there will be a tendency for the lens to follow the current of this flow and gradually to be pushed forward, leading to a shallowing or obliteration of the anterior chamber. We have then in the depth of the anterior chamber an indication as to whether the case falls in the class of anterior or posterior group.

If the anterior spaces are obliterated they may be relieved in part by a broad, deep iridectomy. On the other hand, if the anterior spaces are normal, and the obstruction is excessive in the posterior lymph channels, an iridectomy will be of no avail.

The means by which a trephine operation relieves the tension has nothing to do with the condition of the lymph channels. It is based entirely upon the establishment of a permanent filtrating cicatrix which permits excessive fluids in the globe to pass out into a subconjunctival space and become absorbed.

If, therefore, we have an anterior glaucoma the choice of operation would be an iridectomy. On the other hand, if the posterior system, or both the anterior and posterior are involved, the trephine operation will be the one of choice. There is one exception to be made. We all know only too well that cases of simple non-inflammatory glaucoma, which have so far advanced that the visual fields are contracted to twenty or thirty degrees, do not do well after an iridectomy has been performed. I would, therefore, make an exception of this group, whether classified as anterior or posterior glaucomas.

To summarise: (1) The depth of the anterior chamber is our standard of classification in the anterior and posterior glaucoma. (2) All cases of glaucoma which can be classified as anterior, with the exception of those cases in which visual field is markedly contracted, should be subjected to an iridectomy; while all cases of posterior glaucoma and all cases of markedly contracted field of vision should be subjected to a trephine operation.

I wish again to emphasise the fact that these observations are all based on clinical observation, and have not been verified by the examination of pathological specimens.

In this connection I shall report a portion of the results obtained

in a series of cases reported before the Clinical Surgical Congress at its meeting held in Philadelphia, 1916.

In nineteen cases of glaucoma in which an iridectomy was performed a good result was obtained in thirteen cases, or in 72.2%.

In forty-one cases of simple glaucoma, which were subjected to the Elliott operation, a good result was obtained in thirty-one cases, or 75.6%.

The nineteen cases selected for an iridectomy offered a more favourable group for any operative procedure than did those selected for the trephine operation.

Conclusions.

1. All cases of simple non-inflammatory glaucoma should be subjected to a course of general and local treatment before being subjected to any operative procedure.

2. All cases of anterior glaucoma, excepting those with marked contraction of the visual fields, should be subjected to a broad iridectomy.

3. All cases of posterior glaucoma, and all cases with marked contraction of the visual fields, should be operated on after the method of Elliott, and a sclero-corneal trephine operation performed.

PARALYSIS OF DIVERGENCE

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A short time ago, when I presented a case of divergence paralysis at a meeting of ophthalmologists in New York, I was struck by the lack of familiarity with the condition which most of those present manifested. Some who attended the meeting were surprised that the patient did not show double external rectus paralysis. In talking with neurologists it become evident to me that they were not aware of the existence of a divergence centre, and that some of them were not familiar with the function of ocular divergence, and so had not thought of the possibility of paralysis of divergence. Thus I was prompted to take the liberty of calling this condition to your attention, hoping that some of you have seen clinical cases and that you will report them.

For many years Duane has made careful studies of the functions of convergence and divergence, and he more than anyone else has insisted on the importance of a distinction between the function of convergence and that of internal rotation of the eyeball (adduction, adversion), and of a similar distinction between divergence of the eyes and external rotation (abduction, abversion). A patient may be able to perform absolutely normal inward rotation of each eye by looking to the right and to the left, and yet may be without the power of normal convergence. Similarly, a patient may be able to perform outward rotation of each eye in a perfectly normal manner, and yet have partial or total paralysis of the divergence power. Too much stress cannot be laid on this point.

Divergence paralysis is a striking condition, and once seen and studied it is always remembered and easily diagnosed. The *onset* is usually sudden, and is accompanied by *diplopia* with its usual distress. This diplopia is greatest for distance, and at close reading range is not present at all. The patient suggests the diagnosis when he says to the oculist that he sees double when looking off at a distance, but that he can see to read all right. A marked convergent squint is apparent. In testing the outward rotations the examiner finds them normal in each eye. If a light is carried toward the patient from a distance the double images seem to gradually approach each other until they fuse when the light is several inches from the eyes. This fusion is referred to by Duane as binocular "single vision by approximation." Now after fusion has been accomplished, if the light is with-

drawn, fusion of the images is maintained until the light is several inches further away. Here Duane applies the term "single vision by recession." This maintenance of binocular single vision as the test object is withdrawn from the eye represents the patient's ability to relax his convergence. Relaxation of the convergence, with consequent lessening of diplopia, can be enhanced by having the patient look up. Perhaps the most striking thing brought out in the subjective examination of cases of divergence paralysis is that as the patient looks to the right or to the left there is actually less diplopia than in the primary position, so that when the testing light is carried to the right or to the left the images seem to the patient to approach each other. Thus it is seen the external recti readily perform their part in the conjugate movements. This is in sharp contrast to what happens when the same test is made in a case of external rectus paralysis. As you all know, diplopia is increased as the patient looks to the right if the right external rectus is paralysed, and similarly it increases as the patient looks to the left if the left externus is paralysed, and if both externi are paralysed diplopia increases whether the patient looks to the right or to the left from the primary position.

Following is a typical example of paralysis of divergence: In February, 1918, a man (W.J.) twenty-five years of age, called at the New York Eye and Ear Infirmary saying that on August 1st, 1917, while digging a ditch, his vision suddenly became confused, and since that time he has seen double at a distance. He was in a hospital three months, but left unimproved. His vision was normal in each eye, and there was no abnormal condition of the interior of either eye. Pupillary reactions were normal. The urine was normal. Wassermann tests of both blood and spinal fluid gave negative results. Neurological examination was negative. The characteristic features of divergence paralysis were well shown. The tropometer showed normal excursions of each eye in all directions. The far point for binocular single vision by approximation was about fourteen inches, while the far point by recession was twenty-four inches. The point of equilibrium was four inches from the root of the nose. The fact that this point of balance was found to be so close probably indicated the presence of an associated convergence excess. Diplopia decreased slightly as the patient looked to the right or to the left, whereas it would increase in looking in one of these directions if there were a paralysis of the external rectus. In this case paralysis of divergence probably resulted from hæmorrhage into the divergence centre, while the patient was under physical exertion.

Ætiology.

In order to explain paralysis of the function of divergence, it seems necessary to assume the presence of a divergence centre in the brain and a lesion which affects this centre. No such centre has been localised, but Duane (1) suggests that the probable location is in the vicinity of the nuclei of the sixth nerves, which are close together near the median line in the floor of the fourth ventricle. The behaviour of a case recently seen by Dr. B. W. Key tends to substantiate this suggestion. On March 2nd, a male, fifty-nine years of age, presented himself at Dr. Key's office, complaining that on the previous day while crossing a street he suddenly became dizzy. Immediately afterwards he noticed that he had double vision for distance. Diplopia for distance remained, but objects at near range were single. He could read without difficulty. Dr. Key considered the case clearly one of typical paralysis of divergence. Four days after the first examination this patient showed unmistakable signs of paralysis of the external rectus of the right eye, namely definite limitation of motion outward in the right eye, and marked separation of the images from a test object when carried to the right. Two and a half months before, this patient suffered a serious attack of pneumonia. Duane (2) mentions as possible causes of paralysis of divergence, syphilis, tabes, multiple sclerosis, lead poisoning, cerebral tumour, antecendent pneumonia; but he adds, "in the majority of cases, the affection has occurred without obvious cause, although from the suddenness of development and the permanence of the symptoms it seems not unreasonable to infer that it has been due to localised hæmorrhage." In 1916, Alger (3) reported nine cases of divergence paralysis. He mentioned as causes, cerebral hæmorrhage, cerebral syphilis, tabes and diphtheria.

Prognosis.

For recovery from the paralysis the prognosis is bad, as usually the condition persists. For relief from symptoms the outlook is rather good, as usually one eye takes upon itself the responsibility of performing fixation, and the patient slowly learns to disregard the images in the other eye, which after a time constantly manifests convergent squint.

From disuse of divergence, weakness of abduction may result; and there is the possibility of the onset of paralysis of function of the sixth nerves. It should be remembered that divergence paralysis may be a manifestation of a serious organic lesion which may endanger the life of the patient.

Treatment.

Depending upon the cause constitutional treatment may or may not be important. During the early months of the divergence paralysis relief from the distress of diplopia is found in a cover for one eye. In all probability the eye which is covered will become the squinting eye and the one which is exposed will become the fixing eye. Refraction is of little importance, and prisms (base out) are not of value unless the diplopia is slight. No operative treatment can be curative, but shortening the external recti should accomplish diminution of diplopia, or at least recession of the far point of binocular single vision with consequent increase of the range of single vision. In addition, it should improve the cosmetic blemish which the convergent squint occasions. In these cases it is not wise to operate until one is sure that the paralytic condition is stable; and after several months have passed and the oculist is convinced of the persistence of the squint, usually distress from the diplopia has largely passed away and operation is not imperative. However, probably it is good judgment for the oculist to recommend resection or advancement of the external recti.

(1) Duane. Ophthalmology, October, 1905.
(2) Duane. Ophthalmology, October, 1905.
(3) Alger. Trans. Amer. Ophth. Soc., Vol. 14, p. 665.

THE VALUE OF RADIUM IN THE TREATMENT OF LESIONS OF THE EYE, EAR, NOSE AND THROAT

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It is now generally accepted, by those familiar with its use, that radium holds a distinctive place in the treatment of neoplasms. In no class of cases is it of greater value than in the types seen by the oto-laryngologist. This is particularly encouraging because of the fact that the results following the surgical treatment of many of these neoplasms have not been satisfactory. The special value of radium in such cases is that it may be carried directly into the antrum, naso-pharynx or larynx, and thus come in direct contact with the neoplasm.

Radium has a specific or alterative action on certain tissues, such as basal cell epithelioma, sarcoma, angioma, etc., causing the tumours gradually to shrink up and disappear. Its action on other types of tissue, for example the squamous cell epithelioma, is destructive. The more rapidly growing tumours, such as lymphosarcomas, are made to disappear much more readily by the use of radium than are the slow-growing tumours, such as mixed tumours of the parotid or slow-growing fibromas of the nose.

Methods of Application.

The radium is applied in the form of a placque or disc, over the surface of which it is spread out and held in place by a varnish; or it is applied in a glass tube inside of a silver tube about one-sixteenth by one-half of an inch in size. The disc form of application is used with little or no screening, in superficial lesions, or it is screened and applied to penetrate, as in the treatment of glands of the neck. The tubes are used with screening in applications over the tumour, or they are inserted directly into the tumour. The size of the tube usually employed contains from fifty to one hundred mg. of radium element. The radium emanation has not been used in any of our work.

In treating the nasopharynx the tube is placed in a curved lead applicator and the radium carried to the space after cocainisation. In treating the larynx a tracheotomy is performed, and, after cocainising the larynx, the radium is dropped directly into the region requiring it. In some cases, especially of multiple papillomas of the larynx in children, the radium is inserted directly into the larynx on a forceps and left in place while the patient, under anæsthesia, is suspended by

the Lynch suspension apparatus. Neoplasms of the antrum are treated by making an opening directly into the antrum above the alveolar process by means of a soldering iron, and then the radium, with no screening but the silver tube and a rubber finger cot, is inserted directly into the centre of the tumour. In treating the antrum and larynx, radium is also applied with screening outside of the cheek or larynx and elevated about an inch from the skin to avoid any superficial reaction. In angiomas or lymphangiomas of the lips, cheeks, and tongue the radium is inserted directly into the tumour by burrowing into it through the normal tissue. In lip and cheek it is inserted from the inside of the mouth, and thus any external scarring is avoided. Frequently special applicators have to be made in order to apply the radium to some particular area.

Types of Cases Treated.

Radium is used in many of our cases post-operatively. In fact in all cases of malignancy of the nose, throat and mouth in which the patients are treated surgically, they are also treated with radium following the operation. In inoperable cases the possibility of relief from treatment with radium is explained to patients, so they may thoroughly realise that nothing surgical will help, and that just what the radium will do is questionable, although months or even years of relief may be obtained, and possibly the condition may be cured.

In cases suitable for surgical treatment, radium alone is not used as we feel that if the condition is surgical, the patient should be given the benefit of both methods of treatment. Radium should never be employed in lesions such as those of the lower lip, for example, unless they have been diagnosed microscopically. The safer procedure is to excise the lesion for diagnosis, and if it is malignant, the glands of the neck draining the area should be removed in order to prevent metastasis. Many mistakes are made by removing with radium or some treatment other than excision, a lesion of the lip which is malignant, the patient later developing metastasis in the neck with the possibility of cure reduced about fifty per cent.

During the last two years at the Mayo Clinic 211 neoplasms of the nose, throat and mouth have been treated with radium. These cases are exclusive of the cases of basal cell lesions of the nose, face, etc. While it is too soon to report end results in this group I shall, in a general way, outline the results to the present time:

1. *Nose* (intranasal).

Epithelioma	9
Papilloma	3
Myxoma	3
Sarcoma	1
Total	16

2. *Nasopharynx.*
   Epithelioma 5
   Myxoma 3
   Fibromyxoma 1
   Fibrosarcoma 1
   Lymphosarcoma 3
   Malignant Tumour 1
   Total 14

3. *Antrum.*
   Epithelioma 9
   Sacroma 4
   Myxoma 1
   Fibroma 1
   Total 15

4. *Pharynx and tonsil.*
   Epithelioma 6
   Sarcoma 4
   Total 10

5. *Larynx.*
   Epithelioma 21
   Multiple papilloma 13
   Angioma 2
   Lupus (pharynx and larynx).. 2
   Total 41

6. *Jaws and cheeks* (intra-oral).
   Epithelioma 47
   Sacroma 3
   Lymphangioma 2
   Adamantinoma 3
   Total 55

7. *Palate.*
   Epithelioma 7

8. *Tongue.*
   Epithelioma 13
   Lymphangioma and Angioma..10
   Lymphosarcoma 1
   Total 24

9. *Upper lip.*
   Angioma 11
   Basal cell epithelioma 8
   Lymphœdema 8
   Total 27

10. *Lower lip.*
   Angioma 2

Tumours of the Nose. Angiomas of the external nose are readily taken care of by radium, and the results are far superior to those obtained with the use of hot water injection or CO_2 (carbon dioxid) snow. In the cavernous type the radium is inserted directly into the tumour. The basal cell epithelioma of the nose formerly was excised with a cautery, especially if the cartilage was involved. Later, if the condition was cured, a plastic operation was necessary to close the opening of the nose. Such growths are now cleared up with radium with the smallest amount of deformity, if any.

Intranasal and Ansopharyngeal Tumours. Sarcoma, myxoma and fibroma are best treated with radium. The operative treatment of such tumours usually involves considerable risk, because of the liability to hæmorrhage and in most cases the tumour recurs. By the use of radium the patient is usually markedly benefited, receiving months or years of relief, if indeed the condition is not entirely cleared up. In the treatment of such tumours, other than the fibroma or fibrosarcoma, it is best to apply the radium to the cervical regions also, in order to prevent glandular involvement.

Operative measures in the treatment of epithelioma of the nose are usually of little value. Radium frequently clears up the ulceration and discharge and scars down the growth, giving the patient much relief, and sometimes accomplishing more than this. Myxomas of the nostril, which are not associated with a sinus infection and which always recur after removal surgically, are caused to disappear by the use of radium.

Tumours of the antrum. In cases of malignancy of the antrum, unless of the type of fibroma or fibrosarcoma that shells out readily, the condition is treated almost exclusively by making an opening into the antrum above the alveolar process by means of a soldering iron and inserting radium. In one group of cases, especially if the cheek is involved, treatment by resection of the upper jaw is not satisfactory. The method of cooking the tumour by means of soldering irons and slow heat for from one-half to three-fourths of an hour, followed by radium in the cavity, is to be preferred and gives much better results, notably in cases of sarcoma.

Tumours of the pharynx and tonsil. Probably the most spectacular results are obtained in the treatment of a lymphosarcoma of pharynx. A high mass filling the pharynx will melt away, and in three or four days disappear without leaving a trace. In such cases, however, enlarged cervical glands frequently develop, and while these may be cleared up, the patients may die of chest metastasis, although they have received months or years of relief and comfort. Such conditions are hopeless surgically, and radium will accomplish a great deal.

With all the measures at our disposal, epitheliomas of the tonsil are very difficult to clear up, but we have one patient who has been free from recurrence for nearly two years following an extensive recurrence after excision and cautery. Other patients have been markedly relieved and improved, and we feel that the possibility of improvement and help warrants the use of large doses of radium, preferably after removal of the growth. If there is a good possibility of improvement in the local growth, a block dissection should be done and this followed by radium over the neck. Lupus of the pharynx is readily cleared up with radium, and seems to be the most satisfactory way of treating it.

Tumours of the larynx. An extensive squamous cell epithelioma of the larynx is usually considered a hopeless problem, since surgery offers very little in the way of relief. We have treated such cases by doing a tracheotomy, and after cocainisation, dropping the radium directly into one larynx. The radium is held in place for from one to one and one-half hours at a time. While all patients are not benefited, very encouraging results and remarkable relief have been obtained. One man had an extensive carcinoma of the larynx obstructing the glottis so that it was necessary to do a tracheotomy; he was swallowing fluids only. In two months' time had gained forty-eight pounds and could eat anything. He had a cork in the tracheotomy tube. The growth did not recur locally but the patient died of chest metastases about fourteen months later. However, the treatment gave

him a year of comfort. The local tumour does not always completely disappear, as in the foregoing case, but the patients that do improve make one feel that everything possible should be done to give them the benefit of radium.

Lupus of the larynx is treated by dropping the radium down into it after cocainising. The results are very good.

One case of angioma of the larynx, causing dyspnæ in a child, which would have been very difficult to benefit in any other way, was entirely cleared up by the external application of radium.

The treatment of multiple papilloma of the larynx in children has been improved wonderfully by the addition of radium. The patient is suspended with the Lynch suspension apparatus, the papillomas are cleared out, and while thus suspended the radium is placed in the larynx. We have treated two cases of multiple papilloma of the larynx in children without tracheotomy, the only treatment being radium on the outside of the neck. The tumours cleared up entirely and have not recurred.

Lips. Ulcer of the lip or epithelioma of the lip should not be treated with radium. Every suspicious lesion of the lip should be excised for diagnosis, and if it is found malignant the submaxillary and subemental glands should be removed. Many such lesions may readily be cleared up with radium, but it cannot be determined whether or not the lesion is malignant, without a miscroscopic examination. Many patients come with metastasis in the neck with an epithelioma of the lip which has been removed with radium or some other means, and no glandular dissection done.

Tumours of the jaw and cheek. In the treatment of malignancy of the jaw and cheek the growth, if surgical, is first thoroughly cauterised by slow heat cautery by means of a soldering iron. In about two weeks radium is applied directly into the raw area. The radium is applied again in from three to four weeks, and as often as necessary later. The addition of radium to the treatment has made our immediate results much better than they have even been before. Twenty-one cases of cancer of the jaws and cheeks were treated during the year 1917; twenty of the number have been traced; fourteen of these have had no local recurrence. In two of the fourteen cases glands of the neck have developed, and block dissections have been done. In one case of primary squamous cell epithelioma of the cheek almost perforating, the tumour cleared up entirely, and there has been no recurrence for more than a year. This, of course, is an unusual result, but it is a stimulant to give the patient this chance of help in many inoperable cases.

Leucoplakia of the mucous membrane of the mouth is treated with radium, and the condition cleared up.

Tumours of the Tongue. Cases of lymphangioma and angioma of the tongue are very difficult to deal with surgically and, as a rule, very little is accomplished. Radium is a specific for these conditions, and very large tongues will become reduced almost to normal in a few weeks or months. Radium is either inserted directly into the tongue, or screened and applied over the tongue.

Radium is employed in epithelioma of the tongue, occasionally alone if the condition is inoperable, or if the patient's general condition will not permit operation. It is more frequently used post-operatively after excision of half the tongue and block dissection. The radium decreases the discharge, scars down the lesion and makes the patient much more comfortable.

I have not seen in the literature, reports of the use of radium in thrush, but in our experience its repeated application has eliminated this very persistent trouble.

Results.

The immediate results of the treatment of the neoplasms of the nose, throat and mouth with radium are, as a whole, very encouraging. Many patients previously operated on with a recurrence following, are now treated with radium and the neoplasm disappears, giving months or years of relief, with no surgical mortality. The patients are made much more comfortable than they would be with an operation. The number of patients that will be permanently cured of a true malignancy with radium is probably very small relatively, but the number of inoperable cases that are markedly relieved and receive months or years of comfort is quite large. We do not, however, recommend the treatment by radium of any neoplasm that is surgical. In such cases the patient should have the benefit of both surgery and radium. The use of radium has changed entirely the prognosis in neoplasms of the nose, throat and mouth.

TONSILLECTOMY UNDER NITROUS OXIDE AND OXYGEN ANAESTHESIA, THE PATIENT SITTING, BODY INCLINED WELL FORWARD

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If it were not for some well-established facts concerning the subject of my paper, I should feel the necessity of writing an apologetic preface to my remarks on tonsillectomy, if I deigned to present it at all; for, without doubt the tonsil question is in present-day medical and surgical literature greatly in evidence, and it is this reason, more than any other, that argues to me that, because of such variance of opinion among men of wide experience, there must be yet much to be learned and many words still spoken and written before the last word is said regarding what has become to-day, more than ever before, a vital question.

Not until there is more unanimity of treatment, especially surgical treatment, of the tonsil, can we feel that the profession has mastered the subject. We recall the appendiceal maze of twenty years ago, from which finally emerged an almost uniform technic after an army of investigators had completed their findings and had proven that which was the wisest and best procedure; so that, now, the subject of appendicits and its surgical treatment rarely appears in our literature.

I trust that the time is approaching when we shall see a more definite, methodical technic in tonsillectomy: something that all may unite upon instead of the thousand and one tonsil operations of to-day. Tonsils are, in the main, uniform as to their structure and attachment. Throats vary only in size. There should be no more variance in the method of their removal. If a definite, precise order may successfully be followed in all cases, children and adults, if necrotic, firm, submerged or pedunculated tonsils, or the stump following a tonsillotomy, may be surely and safely removed by a routine procedure in each and every case, would it not be desired, rather than the diversified technic or absence of technic which to-day is unparalleled in all other surgical operations.

Through recent investigations, the tonsil, as a source of systemic infection, has become more prominent than heretofore. It is established beyond dispute that it affords one of the most prolific foci of infection in the whole body. The character of these infections, and the permanent damage done by them to the heart and many other

structures, demands a most perfect operation to prevent the continuation of the infective process through the avenue.

Since it is my purpose in this paper to avoid an elementary discussion of the pathological conditions, connected with infected tonsils, I must apologise for digressing for a moment to call your attention to an interesting suggestion that is now being followed up by many observers, viz. that a large number of thyroid enlargements with tachycardia are being markedly benefited by tonsillectomy. Dr. Layman, of Indianapolis, who has tabulated by *questionaire* 894 cases as results of tonsillectomy in the well known arthritic, cardiovascular, and other toxæmias, has letters from prominent surgeons, who do a great deal of thyroid surgery, showing that there is a decided uniformity of opinion regarding the relationship between tonsillar infection and the enlargement of the thyroid and hyperthyroidism. All of them advise tonsillectomy in goitre cases that give a history of tonsillar infection, but they do not depend on the procedure as a curative measure. They differ in their views as to the time of performing tonsillectomy; some advocating it before and others after the thyroid operation. Dr. Crile, of Cleveland, and Dr. Halstead, of Baltimore, prefer to operate on the thyroid first, especially when the symptoms of hyperthyroidism are well marked, because tonsillectomy is a trying operation for these patients. Dr. Bloodgood, of Baltimore, writes: "The tonsil infection or coëxistent infection should be taken care of before attacking the thyroid, and there should be at least two or three weeks between the tonsillectomy and the operation upon the thyroid." He also states that, in 50% of the cases of toxic goitre, he has found either infected tonsils or infected nasal cavities. At the Mayo Clinic they do the thyroidectomy to relieve the symptoms and the tonsillectomy to prevent, if possible, recurrence of hyperthyroidism in the remaining lobe.

In the early years of child life, the tonsils are subjected to a vast amount of infective material in the form of ordinary dirt as well as those of diseases having tonsillar manifestation. If the tonsil through the early months and years protects the child without itself becoming diseased, it should not be removed. But, if it becomes damaged and, therefore, not only fails to protect, but becomes a source of infection, which at any time may find its way into the blood stream, causing heart disease from which the patient may never completely recover, or rheumatism with its unhappy consequences, tuberculosis, etc., there is one proper treatment—*complete* removal of the capsule.

At the present stage of development, the only sure means of securing all tonsil tissue is to include with it the capsule—the extracapsular

enucleation. The result is ideal so far as removing from the patient the source of danger to his health and life, which is, of course, the greatest consideration; while the extracapsular operation does this, and is not to be discarded for anything which fails to remove all tonsil tissue from the fossa, the writer hopes for an intracapsular tonsillectomy to be also thorough and complete leaving the capsule *in situ*. That would prove indeed to be the ideal operation, both hygenically and cosmetically, for all operators are aware that a disappointment in our tonsillectomies, as now performed, is the asymetry of the tonsillar fossa following some weeks after the operation, this is due, in part, to cicatrisation of the area of the pharyngeal muscle previously covered by the capsule, which, being denuded, must of necessity be covered by granulation tissue. Braun and others are now claiming to split the capsule and leave one or more layers attached, but the results of their claims are not yet established. The desirability of leaving the capsule is, however, to my mind, not so great, as some writers believe. There are those who attribute serious voice impairment to the loss of the capsule. In my opinion, this is not true. In a series of more than one thousand operations, since adopting the technic which includes dull dissection, I have not had one case of voice impairment. In those cases in which the voice has been impaired, which have come under my observation, all show, besides the capsular cicatrix, some injury to the pillars, especially to the posterior ones, which have most to do with the soft palate. It is conceivable, however, that in singers, where even the minutest disturbance of the delicate musculature which we find in this area, a slight restriction in the formation of certain tones might follow from even the small contracture of the tonsillar fossa as it heals over the capsular area. On the other hand, all operators have observed a definite improvement in some singers' voices, amounting to an increase in their tone register from one to three notes, from the clean enucleation of a diseased tonsil with adhesions, or a tonsil stump.

The greatest immediate dangers in tonsil operations, as ordinarily performed, are anæsthetic, hæmorrhage and asphyxiation from inspired blood. A remote danger is pulmonary abscess. It is doubtful if the anæsthetic should be given first place as a danger factor. The recumbent position which has been, and is still, the position most commonly employed, subjects the patient, in a tonsil operation, to the danger of drowning or suffocation from the hæmorrhage, which, in some cases, has been attributed to the anæsthetic. When local anæsthesia is used, secondary hæmorrhage is more liable to occur.

We are finally convinced that the facts as given above, constitute

the *bete noir* of tonsil surgery, and that the only solution of the whole problem is the technic which includes the forward inclined sitting posture with general anæsthesia for both child and adult.

More than seven years ago, I witnessed for the first time, the Massachusetts General technic, in which the patient sits in an ordinary arm chair. Anæsthesia is started with nitrous oxide, and then changed to ether.

I was, of course, profounding impressed, not only with its advantages but with its possibilities, if still further improved. The glaring defects were, first the erect posture with chin elevated, which allowed the blood and saliva to pool in the oro-pharynx; and second, the necessity in most cases of interrupting the anæsthesia, and, in many instances, a second etherisation was required for the last tonsillectomy, as the patient would come out of the ether during the first one.

The first of these defects I worked out to my own satisfaction, in the position which I will show you, secured by a specially designed chair, and permits of several adjustments, one of which is that the back can be leaned or inclined well forward, the chin well declined, thus suspending the patient as it were, in such position that gravity takes care of all blood and secretions, which run forward over the tongue and out of the mouth. The Boston sitting posture has only a small advantage over the recumbent posture, the surgeon can see perhaps more of his field, especially the superior portion of the fossa; but, on account of the horizontal or upward inclined oral axis, the blood pools in the fossa or oral cavity, and may be inspired into the trachea and lungs, unless the same methods used in recumbent posture, such as sponging and suction apparatus are employed. Unless the patient is profoundly anæsthetised, much blood is swallowed, to be later emitted by vomiting, at the danger of inducing a hæmorrhage. Those who witnessed the Boston sitting posture will recall that frequently the assistant or operator drops the patient's head suddenly forward to eject large quantities of blood or mucus from the mouth or throat. The second objection noted, the interruption of anæsthesia, I took up with Dr. McKesson who solved it for me six years ago. The answer is nitrous oxide and oxygen. The technic of its administration will be shortly given to you by Dr. McKesson.

I trust that you will pardon me for thus emphasising the variance of the so-called Boston sitting posture, from the forward inclined, or suspended sitting posture, in which neither sponging nor suction is used, the force of gravity much more effectively caring for this troublesome and menacing complication. Among other reasons why I prefer this position are, that the structures are in normal positions and rela-

tion as examined previously to operation, and it is the only position in which the blood may always be kept from entering the trachea. Many operators prefer local anæsthesia in adults, and its many disagreeable features, both for the operator and the patient, solely because of the erect posture. These same surgeons must, however, use a general anæsthetic for their little patients.

Technic.

The patient is placed in an especially designed chair, which is adjustable for all sizes of patients, having no arms or foot rest. The seat of the chair is brought two and a half or three feet from the floor, the back of the chair is then brought forward *beyond* the vertical meridian, and the head-rest further forward so that the oral axis is pointed downward towards the floor at an angle of 120°, or about the reading posture. The patient's body is, therefore, inclined forward, the chin down near the chest and the feet clear of the floor. The patient's position is thus maintained by a series of straps passing about the ankles, the pelvis and the shoulders. These straps are always adjusted before beginning the anæsthesia. It is of extreme importance to retain the shoulders against the back of the chair so that the head-rest may accomplish the very important work of declining the chin. This we accomplish by a figure-of-eight strap passing under the arms, over the shoulders, and crossing back of the chair, thus maintaining firm pressure. This position aids respiration by holding the shoulders back.

The operator lowers his stool to the point where his visual line corresponds to the axis of the oral cavity, so that, when he looks into the patient's throat, his line of vision is directed well upward. Any blood will now run forward out of the mouth even from the adenoid area.

The Klar headlight, with the tungsten lamp and battery in pocket, is employed so that the light is constant and no chords interfere. Sufficient daylight is admitted on the patient's left or right to permit the anæsthetist to note the change in colour as an aid in determining the depth of anæsthesia.

The usual sterile sheets and towels cover the patient.

The nasal inhaler is now applied with elastic bands about the head to hold it in position; the breathing tube, leading to the gas-oxygen apparatus behind the chair, is connected to the inhaler and the patient is instructed to breath through the nose. After three or four inhalations, the mouth gag is inserted, and the mouth covered by thick gauze. If the gag is inserted before beginning the anæsthetic, it frightens

many patients; but, by the time three or four breaths are taken, they do not fear it. Thus, too, if the insertion of the mouth gag is too long deferred, a rigidity of the muscles makes it difficult or impossible to open the mouth.

During the period of induction of the anæsthesia, as well as throughout the operation, the operator may coöperate with his anæsthetist in noting various signs and symptoms, which indicate the stages of anæsthesia. These are the pupillary contraction and dilatation, its reaction to the light when the head light is suddenly thrown into the eye, the anæsthesia of the cornea, the colour of the face, lips and conjunctiva, and, while operating, the colour of the mucus membranes of the oral cavity and pharynx. All of these can be more easily observed by the operator, since the anæsthetist stands behind and to the right of the patient.

The following method of attack is not varied and is methodically carried out in each case, in patients of all ages.

The tongue is depressed with the tongue depressor in the left hand and a tenaculum is applied to the right tonsil and locked. Still holding the tenaculum in the right hand, the assistant exchanges the dull curved dissector for the tongue depressor in the left hand; with this the mucus membrane between the anterior pillar and the tonsil is broken vertically far enough to admit the tip of the right index finger. The operator now takes the tenaculum in his left hand, and, elevating the wrist, reaches the right hand under the left wrist, inserts the right index finger into the opening made by the dissector, pushes the finger into, and sweeps the tonsil fossa, completely separating the capsule from the pharyngeal muscle upon which it lies. The snare of the Brown type with a No. 7 piano wire only (no guard over it) is passed over the handle of the tenaculum with the end of the wire loop to the patient's right, the snare handle itself being to the median line of the tenaculum. The wire loop slips into the anterior tonsil fossa, the tip of the snare tube is crowded into the posterior pillar, when the snare is tightened down on the pedicle, *but not severing it,* the adjusting nut is now screwed down to prevent the wire loop from opening. Both the snare and the tenaculum are now dropped into the corner of the patient's mouth and allowed to remain there until the other tonsil is prepared in precisely the same way, only by a complete reversal from right to left in the entire technic from the time the tongue depressor is applied by the right hand instead of the left, until the dissection is finished with the left index finger and the snare applied over the tenaculum with the loop to the patient's left side. The assistant now presses the instruments apart in the pharynx to make

room for the adenoidectomy, which is done at that stage, prior to the actual removal of the tonsils.

The assistant now takes the tenaculæ and the operator both snares, one in each hand, and simultaneously removes both tonsils. The operation is completed, the whole time required not exceeding six minutes, including the induction period of anæsthesia; the operation alone requiring from two to three minutes' time.

We invite particular attention to the mode of application of the snare as it is backwards to the usual method, but much to be preferred because the spring action of the wire *makes* it sweep through the fossa and *follow* the capsule, and the muscle may be crowded *behind* the tonsil because it is not flexible like the wire. The Holder method often leaves a portion of the tonsillar tissue to bleed or cause further trouble, because the wire loop in the posterior fossa is uncontrollable and does not follow the capsule in many cases.

Up to the instant when both tonsil pedicles are severed, practically no hæmorrhage has occurred, but, at this moment, a slight gush of blood is seen, which, by reason of the patient's position, flows outward and downward over the tongue and out of the mouth. After examining the tonsil beds, the nitrous oxide is stopped, while the oxygen is allowed to flow slowly until consciousness is regained, usually requiring from one to two minutes.

The patient is now placed in bed on his side with the face over the edge of two pillows and pointed slightly downward so that the saliva or blood is readily expectorated and not swallowed.

We should be justified in the assumption that no surgeon would attempt to perform a tonsillectomy without first familiarising himself with the minute anatomical structures in the fauces; yet, it is hard to explain the difficulties encountered by those operators who fail to separate the underlying capsule from the pharyngeal wall in any other manner than that the line of cleavage is not recognised. When once the edge of the capsule is lifted, the remainder of the dissection is easy, but, if the separation is attempted inside the capsule, in the tonsillar tissue, nothing is easy, and ones' troubles multiply, probably ending in an incomplete removal of the tonsil tissue, accompanied too often by serious injury to the surrounding muscles, when sharp instruments are used. The surrounding muscles bleed profusely and often dangerously. The field is partially obscure in spite of suction and the vigorous use of gauze sponges, which greatly irritate the delicate membranes and add much to the patient's discomfort during convalescence.

The operator, in his earnestness to secure all tonsil tissue, frantically snips at prominences, which may later prove to have been folds of

some palatal muscles. This may appear too darkly painted, but the end results in thousands of patients presenting muscular destruction, cicatrices, distortions of the soft palate, usually associated with remnants of tonsillar tissue, verify the truth of this picture.

I do not say that it is impossible to do a good, clean, safe tonsillectomy in the recumbent posture under ether, with sharp instruments, but I do affirm that, in so doing, one is always working under difficulties and amid dangers to the patient which are unnecessary.

I mention the line of cleavage to start the capsular dissection. The importance of this was impressed upon me some years ago, when a laryngologist of international fame, whose name is familiar to all of you, himself a designer of one of the popular instruments in tonsil operations of to-day, did me the honour of witnessing my operations. He said, "Doctor, how is it you get under the capsule so easily, I don't understand." I will try to give you the answer as I gave it to him. But his question set me thinking, and I wonder if, after all, this might not be the crux of the whole matter. The reason for the proposal of the guillotine and evulsing procedures which aim to pluck out the tonsils, as if it were foreign body, without the attempt to do a surgical dissection.

The palato-glossus muscle, commonly known as the anterior pillar, is a very thin structure anterio-posteriorally. The line of cleavage lies between this and the tonsil. The anterior edge of the aponeurosis, known as the tonsillar capsule, turns around the base of the fossa tonsillorus, and is lightly attached to the pillar in some cases, and in other cases to the superior constrictor pharyngeal muscle only. In order to get started under the capsule, therefore, one must keep well forward against the pillar. There can be no debate that this separation can best be accomplished by a blunt pointed instrument. The requirements are similar to the introduction of the urethral sound. In order to follow the urethra, and not injure the walls or make a false passage, should a sound be blunt or sharp pointed?

With this initial separation made, the finger enters the fossa beneath the capsule, and one cannot make a false passage. The only thing one can possibly do is to remain under the capsule until the tonsil is free, except the pedical. The finger here has the same elements of safety as the blunt urethral sound. But, instead of unfeeling steel, the delicate sense of touch determines when dissection is complete. All surgery has long given preference to the finger dissection. In delicate separations, goitres, abdominal adhesions, pus-tubes, and so forth, are invariably handled, by the careful surgeon, as much by the fingers as possible.

This *modified* finger dissection, however, is productive of still less trauma and consequent soreness than where the finger is used alone, since the trauma to the anterior pillar resulting from the excessive pressure required to rupture the mucus membrane connecting the tonsil and the anterior pillar is avoided by the use of the blunt, curved dissector as described, preliminary to the introduction of the finger tip.

Hæmorrhage, after leaving the operating table has occurred but five times in over one thousand operations, in which this technic has been used exclusively. In each case it was anticipated, because of systemic conditions. This extremely low record of hæmorrhage is attributed to the anæsthetic, with its consequent absence of nausea and vomiting; to the erect posture, and to the total absence of all edged or pointed instruments in the operation. The vessels which enter the tonsils are crushed by the snare and hæmostasis thus induced. The vessel of the pillars and pharyngeal muscles upon which the tonsils rest are injured and it is these vessels which bleed when severed by cutting instruments. For the same reason, our patients eat with little discomfort within twenty-four hours, because the pharyngeal muscles, which begin the action of swallowing, are uninjured. In this technic, the perimysium is scarcely broken, since, in the finger dissection, the *ball* of the finger tip is kept against the throat wall and the nail against the tonsil. Convalescence is further shortened by the eliminating of the gauze sponge and its trauma, so that the average patient is entirely well on the fourth or sixth day and, at no time, particularly uncomfortable.

Our technic comprising the following features, is original:

1. Forward inclined sitting posture with chin near chest.
2. Continuous nitrous oxid-oxygen anæsthesia *without ether*.
3. Backward application of the snares.
4. Application of a snare to each tonsil, when both are removed simultaneously.
5. Removing adenoids before the tonsils.

Conclusions.

1. This technic is uninfluenced by the size of the tonsil and is equally adapted to the free, the submerged or adhering types.
2. It is applicable to patients of all ages.
3. There is a marked reduction in both the operative and post-operative hæmorrhage.
4. The forward inclined sitting posture is natural, convenient, and the safest position for this operation.
5. In this position blood takes care of itself by gravity, aided by

the flow of gases out of the mouth, in a more effectual manner than it is possible by sponging suction apparatus, or any other position in which the operation may be thoroughly done. The danger of asphyxia by inspired blood or froth is absolutely eliminated.

6. The inspiration of infective materials squeezed from the tonsil, causing pulmonary abscess and gangrene, is in this manner also avoided.

7. Nitrous oxid-oxygen is an ideal anæsthetic for this work in this position; the use of ether is never necessary and has not been employed in a case in our last six years' series.

8. The minimised trauma, agreeable anæsthetic, followed by no post-operative complications, short and fairly comfortable convalescence, produces a more desirable impression upon the patient.

TENOTOMY OF THE INFERIOR OBLIQUE MUSCLE

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In presenting the subject of inferior oblique tenotomy my purpose is to cite the experiences gained and the deductions drawn from a rather large number of cases which have come to operation. Duane has generously placed at my disposal his series of fifteen cases. During the past four (4) years I have operated fourteen. Knapp, Wheeler, Schoenberg and Hubbard have performed seven inferior oblique tenotomies, and I am indebted to them for the privilege of examining these cases before and after the operation, and for the privilege of adding these to my series.

The operation was proposed by Landolt in an article in the *Archives d'Ophalmologie,* 1885. He reported no cases, however, in which the operation had been performed. The next presentation of the subject was by Duane before the British Medical Association in 1906. This paper was not published, but is quoted at some length by Posey in his paper before the American Ophthalmological Society in 1915. In this paper he reported twenty-one cases, four of which were operated by Zentmayer. Todd reported a case before the Academy of Ophthalmology in 1916, and in the discussion of this paper Reber and Green each reported a case.

When a routine muscle examination is made the condition is quite commonly seen. Duane has seen about fifty, and I have observed about thirty, excluding those seen in association with Duane.

The technic of the operation as described by Duane, and reported by Posey in 1915, we have found advisable to modify slightly. It was observed that in several of our cases there was a partial return of function of the tenotomized muscle. Now, when the tendon is engaged on a squint hook it is brought up in the wound. All tissue is dissected away and the tendon is grasped by an artery clamp as close to the floor of the orbit as possible. The dissection is then carried well into the orbital tissue and a second clamp applied as far as possible in this direction. The tendon is then severed to the distal side of each clamp, thus performing a thorough tenectomy. Thus far this procedure has been entirely satisfactory. The cutaneous wound has healed by primary intention in all instances with no noticeable scar.

The indications for tenotomy of the inferior oblique are:

(*a*) Paralysis of a superior rectus muscle, more or less marked, associated with a spasm of the inferior oblique of the other eye. This occurs when, as is often the case in congenital paralysis, the paretic eye is used for fixing. The spasm becomes more pronounced as the eye is adducted, and especially when turned up and in.

These cases naturally subdivide into two groups:

First. Those in which the paralysis of the superior rectus is not associated with any consecutive spasm or contracture of the antagonistic inferior rectus in the same eye. Type I.

Second. Those in which the paralysis of the superior rectus is associated with a consecutive spasm or contracture of the antagonistic inferior rectus. Type II.

(*b*) Paralysis of a superior oblique with a secondary spasm or contracture of the inferior oblique of the same type. Type III.

The operation is undertaken for the relief of subjective symptoms such as diplopia, headache, nausea and vomiting; and the objective symptoms of head-tilting, torticollis, disfiguring upshoot of the eye, vertical and lateral strabismus.

May I illustrate each type?

Type I

Paralysis of the Superior Rectus without consecutive contracture of the Inferior Rectus.

Case I. Mrs. R. A. M., age 28. Has turned head to the right since a child to avoid diplopia. This has increased from year to year. V $\frac{20}{20}$ R and L with —0.25—100^{c} R. H.—24$^{\Delta}$ (screen and parallax test) and 14$^{\Delta}$ by red glass. In associated movements to the left the L. E. fixing, the R. E. shot up and in, while the L. E. lagged. On the tangent curtain the diplopia became very much more marked as the light was carried up and left.

Tenotomy of the R inferior oblique corrected entirely the upshoot. There was no hyperphoria remaining except 2$^{\Delta}$ by screen test.

Case II. Miss L. G., age 25. Myopic since a child and had a divergent strabismus develop when quite young. Has tilted head since she can remember. V. $\frac{20}{20}$ R. and L. with —3.00—3.00^{c} Estropia 20$^{\Delta}$ R. H. 15$^{\Delta}$ for distance. Exophoria 30$^{\Delta}$ R. H. 15 for near. Convergence near-point 85 mm. A tenotomy of the inferior oblique resulted in L. H. $\frac{1}{2}^{\Delta}$ and a reduction of divergence from 30$^{\Delta}$ to 19$^{\Delta}$. A subsequent tenotomy of both externi gave the following: Esophoria 2$^{\Delta}$ for distance. Exophoria 5$^{\Delta}$ for near. Convergence

near-point 60 mm.; no diplopia binocular single vision, absence of headache which had always been severe, and correction of head-tilt.

Case III. E. S., age 9. This case had a convergent strabismus. She had worn full correction some years, and came to the Herman Knapp Memorial Hospital after a double advancement had failed to relieve the strabismus.

V $\frac{20}{20}$ R. and L. with + 2.50 R. H. 15$^{\Delta}$ esotropia 20$^{\Delta}$. Tenotomy of the inferior oblique relieved entirely the hyperphoria and the upshoot in associated movements, and at the same time the remaining convergent strabismus.

Type II.

Paralysis of the Superior Rectus with consecutive contracture of the Inferior Rectus.

Case I. S. C., age 9. Has had head-tilt and an upshoot of the R. E. since a baby. V $\frac{20}{20}$ R. and L. Correction + 2.75. Without his glasses there is a convergent strabismus and with glasses a divergent strabismus. R. H. 30$^{\Delta}$. In associated movements to the left the R. E. shot up. This increased rapidly as the eyes were turned up and left.

In eyes down and left the L. E. was decidedly lower than the R. E. Tenotomy of the inferior oblique relieved the upshoot and reduced the R. H. to 15$^{\Delta}$. A recent letter from the mother states that the appearance has improved markedly since leaving the hospital. An advancement of the left superior rectus will be necessary for a complete correction.

This case was unusual in that the inferior oblique had a double tendon, one had its origin at the usual site and the other about 2 cm. to the temporal side.

Case II. M. B., age 7. When eight months old both eyes were seen to jump up and in in associated movements. For the past four years there has been a divergent strabismus usually of the R. E. V. R. and L. $\frac{20}{30}$ with —0.50—1.00^{c}. Exotropia 43$^{\Delta}$, L. H. 15$^{\Delta}$.

In associated movements to the right, the L. E. shot up and the R. E. lagged, while in movement to the left the R. E. shot up and the L. E. lagged.

A tenotomy of the left inferior oblique reduced the hyperphoria from 15$^{\Delta}$ to 5$^{\Delta}$. The upshoot is entirely relieved and the divergence is reduced. There still remains the upshoot of the R. E. in looking up and left. I shall next tenotomize the right inferior oblique and shall undoubtedly get an increase of L. H. This will be overcome by an advancement of the right superior rectus and if the divergence

persists an advancement of one or both interni, as is indicated at the time of operation.

It is in these combined cases that double hyperphoria (anophoria of some) is frequently observed. When either eye is screened it deviates up behind the screen while fixation is with the other eye. When the screen is moved to the opposite side, this eye moves up behind the screen while the previously screened eye comes down to fix. This is more frequently seen when in making the screen test a prism is used which corrects the predominant R. H. or L. H.

Type III.

Paralysis of the Superior Oblique with consecutive contracture of the Inferior Oblique.

These cases are not frequently seen, only three of the thirty-six reported being of this type.

H. H. has had headaches for several years —V $\frac{20}{15}$ R. and L. with +0.50c 90c. He has also been wearing prism base down 3△ R. and base up L.

R. H. 40△. As the eyes are carried to the left the R. E. shoots up. This is increased markedly in looking up and left. In looking down and left the R. E. acts only slightly.

A tenotomy of the inferior oblique reduced the R. H. from 40△ to 16△. Here a tenotomy of the left inferior rectus, the associated antagonist to the right superior oblique, must be done. As he has been decidedly improved by the tenotomy of the inferior oblique the second operation has been put off.

General Observations

Practically every case had some degree of head-tilting.

Two cases had torticollis. One of these used the paretic eye for fixing, and the other the spasmotic eye.

Torsion is not frequently found either before or after operation.

Spontaneous diplopia is infrequent, but can usually be elicited by a red glass and candle.

Two cases of convergent strabismus have been entirely corrected by the operation, one of these having previously had a double external rectus advancement with only slight effect on the strabismus.

Either esophoria or estropia; exophoria or exotropia, are generally reduced from one-third to two-thirds of the original amount.

No bad effects, such as imbalance of the ocular muscles or scarring have been observed, nor has the refraction been affected in any instance.

SECTION II

MEDICINE

ADDRESS IN MEDICINE ON THE SIGNIFICANCE OF "HEART MURMURS" THAT MAY BE FOUND ON EXAMINATION OF CANDIDATES FOR MILITARY SERVICE

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The mobilization of armies for the great war has led internists in all the countries involved to focus upon the heart of the recruit the many rays of new light that have originated in the more intensive studies of cardio-vascular conditions by the newer methods that have characterised the pathological angiology of our time. When I recall the views that were held by expert clinicians regarding the heart when I was an undergraduate medical student (1886-1890) and compare them with the opinions that prevail to-day, I am impressed with the vastness of the transformation that has taken place. In addition to the marked advance that has been made in methods of clinical examination of the heart and blood vessels, there has been a profound change in our conceptions of the significance of signs and symptoms, a change that has resulted mainly from an increasing application of the findings of pathological angiophysiology and experimental angiopathology (in addition to those of pathological anatomy and histology that were formerly predominant in influence) to the problems of the clinic, partly from a growth in knowledge and experience regarding the relations of pathological conditions outside the circulatory system to the genesis of disturbances of function (and sometimes of structure) within it. To illustrate how rapidly progress has been making in clinical angiology in the last thirty years, I need only remind you of (1) the transfer of emphasis (as far as the prognosis of the cardiopathies is concerned) from the consideration of the heart valves to the consideration of the heart muscle; (2) the insight into the nature

and the significance of the cardiac arrhythmias that has followed upon studies of the initiation and conduction of impulses to cardiac contraction in man and in animals made possible by sphygmography and electrocardiography; (3) the greater precision in outlining the exact position, form and size of the several chambers of the heart and of the different portions of the aorta afforded by better methods of percussion and especially by orthodiagraphy and teleroentgenography; (4) the ease by which the blood pressure, both systolic and diastolic, may now be clinically determined, and (5) the recognition of the fact that profound disturbances of circulatory function may have an extracardiac or an extravascular origin, resulting from influences arriving in the heart or the walls of the vessels from distant organs either by a neural pathway (vagal or sympathetic) or by a hæmal pathway (bacteria, toxines, hormones and other metabolic products). Surely, the examiner of the heart of the recruit to-day faces his problem with an attitude and a preparation that differ markedly from those of the examiner in previous wars! Moreover, the problem with which the examiner of candidates for military service is confronted is very different to-day from what it was formerly. The vast organisation of war in our time involves not only a larger number of men but also a greater division of labour among the men within the army than was ever before necessary. Whereas, formerly none but men capable of undergoing the most severe bodily exertion dare be admitted to the army, to-day army organisations include an enormous number of positions that do not entail severe bodily exertion, and it is real economy to utilise for filling such positions men who have certain defects that would *impaire* their ability to undergo the extreme exertion of the front though they in no way limit their usefulness in the special services of the army not requiring great physical effort. Furthermore, as man power diminishes in a prolonged war, nations find it necessary to enrol, even for service at the front, men with physical defects that would bar them from such service at the beginning of a war when the supply of men is abundant. The Central Powers in Europe are already sending men known to have valvular diseases of the heart to the front, men who earlier in the war had been rejected because of their physical unfitness. From the reports of how these men's hearts behave under strain and also from the reports upon observations in the allied armies of the Entente upon men returned from the front with old heart lesions that had escaped detection before they were sent, we are now rapidly acquiring information as to what diseased hearts will bear, information that will stand us in good stead should the war, unhappily, be prolonged to a period when our own man

power shall have diminished to a degree necessitating action similar to that which has already been forced upon the Central Powers. Though it is possible that no such necessity will arise for the United States or for her allies in this war, our medical men feel that it is incumbent upon them to prepare for every contingency that may arise in a war in which the head of the nation has pledged every man and every dollar necessary to help to win. Plans should be made far ahead for all the situations in which we may find ourselves, however remote the possibility of some of them arising may now seem. All who are interested in the heart of the recruit and of the soldier, are in a better position to-day to judge wisely regarding the cardiovascular requirements in men entering the different branches of military service, than were the medical examiners in any earlier war; indeed, many matters that were in doubt in August, 1914, have been carefully investigated and in some instances of importance at least we have a clearer understanding than before. No one can look over the bibliography of the last four years bearing upon the heart of the recruit, and the heart of the soldier, without gratification. The intensive studies of British and French physicians, to which studies undertaken in America are now being added, have already solved a number of pressing problems, and as the war goes on, many of the questions that still perplex us will doubtless be satisfactorily answered.

The late Major Theodore Janeway, working in the office of the surgeon-general of the United States army, during the last six months of his life prepared a circular in which the criteria for passing judgment upon cardiovascular conditions, were clearly set forth. This circular formed the basis for the regulations concerning the heart and blood vessels prescribed for medical examiners in the "Manual of Instructions for Medical Advisory Boards" issued in February, 1918. I desire to pay a tribute to the wisdom and judgment shown in the preparation of these regulations. Even if certain of the rules will undergo modification as the result of further experience, the general principles laid down are undoubtedly valid, and if they are carefully applied in the examination of candidates for military service, very few mistakes will be made.

In my remarks to-day I shall make no attempt to deal with the whole question of cardiovascular conditions and the army, but shall confine myself to the narrower field of the significance of murmurs audible over the hearts of candidates for military service.

Classification of Heart Murmurs.

Many of the classifications of heart murmurs, especially those given

by writers on military subjects, seem to me unnecessarily elaborate and confusing. The simpler the classification, provided it is adequate, the better. The following simple classification would seem to be sufficient:

Heart Murmurs.

1. *Intracardiac Murmurs.*
   - A. *Organic* (due to diseased heart valves).
   - B. *Inorganic* (not due to diseased heart valves).
     1. Murmurs due to relative insufficiency.
     2. Accidental murmurs due to (*a*) abnormal composition of the blood; (*b*) changes in velocity of flow; (*c*) slight abnormalities of contraction due to nervous or other causes.
2. *Extracardiac Murmurs.*
   - A. Pericardial and pleuropericardial friction sounds.
   - B. Cardiorespiratory murmurs.
   - C. Precordial crackling of mediastinal emphysema.
   - D. Splashing and water-wheel sounds.

Even this simple list is formidable enough, but if the practitioner has been (1) trained in the analysis of the features presented by heart murmurs (time, topography, propagation, intensity, pitch, quality); (2) made familiar with the influence of respiratory movements, of change of posture, and of pressure of the stethoscope upon certain kinds of murmurs; and (3) become thoroughly acquainted with the other changes in the heart and circulation that follow upon organic disease of the heart valves and heart muscle, and with the physical methods of examination by which these can be demonstrated, he will rarely have difficulty in recognising the nature and significance of a murmur, so that he may place it in its proper class.

Recognition of Extracardiac Murmurs.

A. and B. *Pericardial and Pleuropericardial Friction Sounds.*

The friction rubs due to pericarditis, to and fro sounds, scratching in character, close to the ear, often divided into parts, often easily influenced by change in posture and by pressure of the stethoscope, are easy of recognition; so are the pulsatile friction sounds due to the rubbing of the outer surface of the pericardium against the pleura, some of the sounds being synchronous with the movements of the heart, others of them with the respiratory movements.

C. *Cardiorespiratory Murmurs.* These murmurs are not uncommon and by the inexperienced are often mistaken for intracardiac organic murmurs. They are most often systolic in time, though occa-

sionally a diastolic cardiorespiratory murmur may be heard. These sounds arise in the lungs synchronous with the movements of the heart, hence the name "pulsatile pulmonary sounds" sometimes given to them. They are most often heard during inspiration, more rarely on expiration. They cease, or are much changed when the breath is held, and they are greatly influenced by changes in posture. They do not point to any disordered action of the heart and are entirely "innocent" sounds.

D. *Precordial Crackling.* In mediastinal emphysema, the air in the tissues may yield a crepitant sound, suggestive of pericardial friction, synchronous with the systole of the heart. The condition is so rare as to be practically negligible in the examination of recruits.

E. *Splashing and Water-wheel Sounds.* These will be rarely met with in military work. They depend upon the occurrence together of air and fluid near the heart (hydropneumopericardium; hydropneumothorax; cavity in lung; distended stomach).

Recognition and Interpretation of Intracardiac Murmurs.

A. *Organic Murmurs Due to Diseased Heart Valves.* Here we have to deal with the murmurs that occur in stenosis and insufficiency of the aortic, mitral, pulmonary and tricuspid valves. In the examination of recruits, aortic and mitral disease will frequently be encountered, while disease of the pulmonary and of the tricuspid valves will only very rarely be met with.

The systolic murmur of aortic stenosis is usually a loud, rough murmur audible in the second right intercostal space close to the sternum. It is propagated toward the carotids in the neck. On palpitation over the aortic area a systolic thrill can be felt. The aortic second sound is feeble or absent. The pulse is small and anacrotic. The pulse rate is often slow. The heart's apex is displaced somewhat downward and to the left. Sometimes a systolic murmur in the second right intercostal space is due to dilatation of the aorta (lues; arteriosclerosis). If suspected, the proof of such dilatation can be brought by percussion, and especially by roentgenoscopy; and to determine ætiology, the Wassermann test may have to be applied. Definite aortic stenosis is cause for unconditional rejection. Luetic aortitis disqualifies for full military service, but if without symptoms does not disqualify for special service.

The diastolic murmur of aortic insufficiency is usually a soft aspirative murmur replacing the second sound or following it in the second right intercostal space. It may be short, but is oftener long and decrescendo in character, occupying a large part of the long pause.

It is often propagated along the left margin of the sternum and may often be best heard in the third and fourth intercostal spaces on the left side. It is surprising how often such a murmur is entirely overlooked, or mistaken for a systolic murmur, even by medical men supposedly well-trained. The murmur can often be better heard with the naked ear or the monaural stethoscope than with a binaural instrument. Aortic insufficiency is associated with a strong, circumscribed dome-like apex impulse (*choc en dome*), a collapsing pulse at the wrist, visibly pulsating carotids, pistol-shot sounds in the peripheral arteries and enlargement of the left ventricle. In the young recruit, aortic insufficiency when associated with mitral disease is most often a result of rheumatic endocarditis; when not associated with mitral disease, it is most often due to luetic aortitis. In older men, aortic insufficiency is often due to atherosclerotic changes in the aortic valves.

The diastolic murmur of mitral stenosis, often rumbling in character and associated with a palpable thrill, is usually audible only in a circumscribed area near the apex of the heart. Sometimes the murmur is audible only at the very end of diastole (presystolic), terminating in an abrupt snapping first sound. In many cases of slight mitral stenosis, no murmur can be heard, the diagnosis depending then upon the existence of a snapping first sound associated with a strongly accentuated (and often duplicated) pulmonary second sound. Mitral stenosis is always due to a preceding endocarditis. It is in my experience one of the conditions most often overlooked by examiners of recruits.

The systolic murmur of mitral insufficiency is a blowing murmur, usually maximal at the apex where it replaces the first sound, propagated toward the axilla, and sometimes to the angle of the left scapula and often audible also in the second left intercostal space. When due to organic disease of the mitral valve (valvulitis) it is accompanied by accentuation of the pulmonic second sound, by some enlargement of the left ventricle and of the left atrium, and often by signs of mitral stenosis. When not accompanied by signs of mitral stenosis the systolic murmur due to valvulitis may be indistinguishable from the systolic murmur due to relative insufficiency of the mitral orifice from muscular relaxation. In older persons the majority of mitral systolic murmurs are due to relative insufficiency; in younger persons mitral systolic murmurs due to valvulitis are very common. Accidental murmurs are often mistaken for the murmur of mitral insufficiency (*vide infra*).

The systolic murmur of stenosis of the pulmonary valve maximal in the second left intercostal space, propagated towards the left

clavicle and accompanied by a palpable thrill, is a rare finding. When present, it is usually due to a congenital heart lesion, and but few live to the age of the recruit. A loud harsh systolic murmur in the third left space (Roger's murmur), propagated transversely, but not towards the left clavicle, is heard in congenital defect of the interventricular septum. This condition is so rare as to be of but little interest for military medicine.

The diastolic murmur of insufficiency of the pulmonary valve is also an exceedingly rare finding and need not be discussed.

The diastolic murmur of tricuspid stenosis is also extremely rare.

The systolic murmur of tricuspid insufficiency is usually due to a relative insufficiency depending on muscular relaxation. It is audible in the tricuspid area and is not transmitted to the left of the apex. Other marked signs of circulatory insufficiency are present and the heart is enlarged to the right. Persons presenting this murmur are usually so obviously ill that they are never seriously considered for military service.

B. *Inorganic murmurs (not due to diseased heart valves).*

Of the *inorganic murmurs due to relative insufficiency of valvular closure* (from muscular relaxation), those audible at the mitral and tricuspid orifices are the most common. They have been referred to above in connection with the systolic murmurs due to organic changes in the valves. Occasionally diastolic murmurs due to relative insufficiency of the aortic and pulmonary valves are heard, but they are rare. Though these murmurs of relative insufficiency are spoken of as functional murmurs, they are in my opinion often of graver significance than are some murmurs due to organic valve disease, for they always point to enfeeblement of the myocardium.

Of the *inorganic murmurs known as accidental murmurs,* a large number may be met with on examining the hearts of recruits. Some of them are due to *anæmia,* though most of them depend upon changes in the *velocity of flow* or upon *slight abnormalities in the contraction* of the heart muscle due to nervous or toxic influences. They are very common when the heart is excited (neurasthenia; hyperthyroidism). Many of the men who present them and who are admitted to the army will doubtless later on exhibit the "irritable heart of the soldier," the "effort syndrome," or "neurocirculatory asthenia." They are common in men with long narrow chests, with low diaphragm, and with cor pendulum (drop heart). These accidental murmurs may occur at sites in which organic murmurs are often audible (at the apex and in the second left space), but they are often audible over regions in which organic murmurs are seldom heard, as in the preventricular region.

Such accidental murmurs are nearly always systolic in time, but they usually occupy only a part rather than the whole of the systole; in other words they are merosystolic rather than holosystolic murmurs, whereas organic murmurs, and murmurs of relative insufficiency tend to be holosystolic rather than merosystolic. Furthermore, accidental murmurs are usually (though not always) soft, aspirative, superficial murmurs. They are prone to marked variation in intensity, being much changed often by change in posture and by the respiratory movements. Above all they are not associated with enlargement of the chambers of the heart, nor with accentuation of the pulmonic second sound.

The Relation of Murmurs to Acceptance and Rejection of Candidates for Military Service.

A careful study of the Selective Service Regulations (U.S.A.) as they now stand will make it clear that:

1. The presence of an organic murmur is cause for unconditional rejection.

2. The presence of an inorganic murmur due to relative insufficiency of a valve, if associated with any enlargement of the heart, or with accentuation of the pulmonic second sound, is cause for rejection; if unassociated with these signs and the response to exercise is normal, the recruit may be accepted for special service.

3. The presence of an accidental murmur due to anæmia, to neural or toxic influences, or to velocity of flow, is not in itself cause for rejection.

4. The presence of a cardiorespiratory murmur is of no pathological significance, and, of course, does not reject.

Comments.

Experience at a medical advisory board during the past three months, where with Drs. Sprunt, Miller, and Carter, we have examined the hearts of twenty-five hundred drafted men between the ages of twenty-one and thirty-one, indicates—

1. That many organic murmurs (diastolic murmur of aortic insufficiency, presystolic murmur and snapping first sound of mitral stenosis) are often entirely overlooked by examiners in local boards, for they are not infrequently detected in men referred to the advisory board for defects other than those of the cardiovascular system.

2. That many extracardiac (cardio respiratory) murmurs, and accidental intracardiac murmurs, are suspected by medical examiners to be murmurs of serious import.

3. That the hearts of some of the men presenting organic murmurs

are better prepared to stand exertion than are the hearts of some men presenting no murmurs.

4. That good response to the exercise test by no means rules out the existence of organic disease of the valves of the heart.

5. That many men with organic disease of the valves of the heart need not be unconditionally rejected, though according to present regulations they must be, for many of them are entirely capable of undertaking special service not involving severe exertion, and some of them could, without harm, even be given duties requiring considerable bodily exertion. Experience in the armies in Europe would indicate that mild stenotic lesions stand strain better than lesions causing valvular insufficiency. The lesions of "barrage" are less serious than the lesions of "fuite."

6. That, on the whole, while the study of cardiac murmurs is of great importance in estimating the fitness of a candidate for military service, still greater importance attaches to the study of the condition of the cardiac muscle and to the estimation of its ability to bear strain.

INTRACRANIAL PRESSURE

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Intracranial pressure has been defined as the pressure which the surface of the brain exerts against the walls of the cranium. The estimation or measurement of the degree of pressure under normal and abnormal conditions has occupied the attention of both physiologists and clinicians. Sir Leonard Hill, Kocher, Harvey Cushing and others, have laid the foundation of our present knowledge of the subject, and their illuminating teachings have made clear the significance of intracranial pressure, and indicated the lines of treatment of this very important condition.

Physiologists have shown that the normal intracranial pressure varies comparatively widely from zero to 50-60 m.m. of mercury—the average pressure under normal conditions being 100 to 130 m.m. of water. It is the same as the venous pressure in the skull, *i.e.* the same as the pressure within cerebral veins and sinuses, and practically that of the cerebro-spinal fluid; its variations depend upon cardiac systole, the phase of respiration, posture, muscular effort, straining, fatigue, etc. It is of circulatory origin, and is intimately related to general venous pressure, and less so to arterial pressure, When the intracranial pressure is greatly increased and approaches that of arterial tension, then only is the general blood pressure increased as a result of primary intracranial changes. On the other hand high general (*i.e.* systemic) arterial tension is not necessarily accompanied by increased intracranial tension.

The statement that intracranial pressure depends upon the circulation, or is of circulatory origin, is as true when applied to pathological conditions as when a physiological state is under discussion.

The important question for physicians and surgeons to answer is "When does intracranial pressure become pathological?" On this point Hill's teaching is that "by no *physiological* means can intracranial pressure be *maintained* higher than cerebral venous pressure. It is, however, possible that a very sudden and abnormally high rise of arterial pressure should so expand the arteries at the base of the brain as to temporarily compress capillary areas and produce anæmia. Nevertheless the effect can only be momentary, and the circulation once more rights itself, and the blood flow increases in velocity."

When the intracranial pressure, through any cause, examples of which may be indicated later, becomes (pathologically) greater than

the pressure in the venous sinuses, *then the cerebral circulation is disordered*. Then begin venous stasis and cerebral anæmia, which are productive of the signs and symptoms characteristic of increased intracranial pressure.

There is but one vascular system, the circulatory system within the cranium. We may, however, consider this system in relation to intracranial pressure as divided into two systems, the venous and the capillary system, and the arterial system, each without "functionally active vasomotor nerves." The ventricles and subarachnoid spaces and their communicating ways may be regarded as forming a third system of vessels, through which both normally and pathologically, fluid circulates.

There are thus three systems within the cranium, each containing fluid—three vascular systems if you will, the cerebral veins and sinuses and capillaries—venous blood, the capillaries and arteries —arterial blood, and the ventricles with their intraventricular ways and foramina and meningeal spaces, through which circulates the cerebro-spinal fluid. The behaviour, or shall we say the disposition, of the fluid in one or another, or at times in all of these systems, determines intracranial pressure. Hill's statement that intracranial pressure "is of purely circulatory origin" applies alike in a physiological and in a pathological sense.

The part played by these three fluids, or the distribution of them, determines in many instances the degree of intracranial pressure. While Hill maintains that no pathological increase of cerebral tension can be transmitted by the cerebro-spinal fluid, because this fluid can never be retained in meningeal spaces at a tension higher than that of the cerebral veins, yet this view does not appear to take account of the condition which obtains when the intraventricular pressure is raised by blocking of the outlets, by tumour or inflammatory exudate, nor does it regard the effects that seem possible as a result of an abnormally rapid secretion of this fluid. Again it has been stated (on physiological grounds undoubtedly) that the amount of cerebro-spinal fluid is far too small to make much difference in intracranial pressure by shifting its position, or when it is expressed from the space within the cranium. Here again we would urge that a correct estimate of the normal amount of this secretion is almost impossible, while, under various abnormal conditions, an enormous amount of cerebro-spinal fluid has been demonstrated as secreted in a day. The brain of a dog *e.g.* gave 240 c.c in twenty-four hours; and from other observations it would appear that under certain pathological conditions at least, the cerebro-spinal fluid may play a most important part in bringing about changes in intracranial pressure.

Before entering on the discussion of the symptoms of increased intracranial pressure, it seems well to point out that these vary widely according to whether the pressure has *developed acutely or slowly.* Even though the brain is contained in an unyielding case yet it shows a surprising degree of adaptation. Should the intracranial pressure become suddenly increased, the signs are pronounced from the beginning. On the other hand, if the change is brought about slowly, a high degree of pressure may be found with but little disturbance, but scant evidence of its existence being discoverable save only by a searching examination. The symptoms in respect of their acuteness and gravity bear comparison very well with those found in the chest when the whole of one lung is suddenly put out of commission by pneumothorax—the lung in a state of collapse, the mediastinum displaced, pain and breathlessness marked, and death not infrequently supervening in such a case within a few hours. On the other hand, in respect of their mildness and apparent lightness, the symptoms bear comparison with those of pleurisy, with effusion increasing slowly up to the second rib, the mediastinum displaced, and yet only but slight dyspnœa on exertion. In both cases thus developed danger is imminent though not apparent, the margin of safety narrow, the slightest changes may bring about a fatal ending. They bear comparison in one other respect—and a fatal issue may supervene, due to circulatory change—œdema of the brain, œdema of the lungs.

As examples of the acute type, cerebral hæmorrhage, or trauma, may be mentioned, while cerebral tumours, or slowly developing hydrocephalus, afford examples of the chronic type. *The changes following naturally upon an increase of intracranial pressure,* due to the diminution of space from the monopoly of new growth or trauma (that pressure which the surface of the brain makes upon the walls of the cranium or that pressure which any intervening substance, blood, exudate, effusion, tumour—transmits to the brain by reason of its contact within the walls of the cranium limiting, by its bulk, the normal space for the brain) would be the recession of the brain from that point so far as tentorium cerebri and the falciform ligament would admit, and an expression from its various circulatory systems of as much fluid as possible. Generally speaking, the changes are in proportion to the degree of pressure inducing lhanges in

Cerebro-spinal fluid,
Veins
Capillaries and
Finally in arteries themselves,
} These fluids.

involving first the ventricular fluid, and compressing to some extent the veins and venous radicles.

The cortex may first give evidence of the pressure, while bulbar signs and symptoms come later—all depending, of course, on the site of the lesion.

The signs and symptoms of increased intracranial pressure vary, not only according to the rate at which the pressure is raised, but also according to the degree of pressure.

First, the displacement of the cerebro-spinal fluid and narrowing of venous channels compensate or make room for the increased tension. Von Schulten points out that compression representing 5% or 6% of brain volume in rabbits caused narrowing of arteries, dilatation of veins, and projection of the floor of the fundus oculi.

Then, should the pressure increase so that it is greater than the pressure in the cerebral veins, venous stasis is induced. Venous stasis, as pointed out by Kocher, shows itself in altered brain function and pain.

These are dural, cortical and special sense signs:

Headache,
(Ear Signs) vertigo,
Restlessness,
Delirium,
Respiratory changes.

Slight bulbar signs may show themselves in slowing of pulse, or heightening of the blood pressure. The veins of the optic papilla become distended.

A still greater degree of intracranial pressure, which expresses the blood from the capillaries may arise, and cerebral anæmia results. The signs of bulbar involvement may now supervene. The respiratory and vasomotor and vagus or medullary centres are involved. The breathing, nature's protective mechanism to keep the vital centres nourished, becomes irregular, different types have been described, Cheyne-Stokes, Biots, etc. The general arterial blood pressure now increased to a high degree. The pulse is slow, the pupils are now large, now small; the sensorium is now cloudy, now less so, in a word, restlessness and stupor, a state of alternating irritability and non-irritability of centres is clearly demonstrated.

When the intracranial pressure is long maintained, or increases, the centres tire, the paralytic signs supervene, or the centres, no longer irritable, fail, and blood pressure falls, coma deepens, the respiration fails and death follows. Such may be the course of heightened intracranial pressure.

The outstanding symptoms then developing, as a result of increased intracranial pressure, are explained altogether upon the

changes induced in the vessels. As stated in the beginning, "venous stasis" and capillary anæmia, whether induced by a single forceful blow, a displacement of the medulla against the skull, a massive hæmorrhage, meningitis, or a rapidly increasing internal hydrocephalus, may be regarded as explaining all the phenomena of increased intracranial pressure of this important and dangerous condition.

The value of eye ground examination in increased intracranial pressure.

Increased emphasis is being placed daily upon the importance of eye ground examination in all cases suspected of increased intracranial pressure. Clinically and experimentally, changes in the fundus are common, ranging from engorgement of veins and slight blurring of the disc to papillo-œdema and choked disc. The condition is now generally ascribed to a mechanical cause. This view is supported by the experimental work. The cerebro-spinal fluid, under tension, finds its way into the optic nerve sheath, exerting pressure upon the vessels of the optic nerve. Bordley, observing the changes in the retinal vessels, while Cushing tapped the ventricles distended on account of meningitis, saw the tortuous veins in the eye become less distended and the arteries become larger as the pressure on the ventricles was relieved. Cushing remarks that observation of the retinal vessels is almost, if not quite, as valuable in observing the cerebral vessel pressure as the glass window in the skull.

Kearney points out that on examining the fundi of 1,400 children with spastic paralysis, which in 70% of cases, is due to intracranial hæmorrhage at birth, 300, or about one in five, showed distinct œdematous changes in the fundi, due to increased intracranial pressure.

In observing many cases in the Royal Victoria Hospital, one concludes that time is a factor in the development of fundus signs, for in nine cases of meningitis where the intracranial tension as indicated by lumbar puncture was *high,* in only two cases were any changes (and these but slight) noted in the fundus. These hospital patients had been ill from four to eight weeks. In eighteen intracranial tumours of much longer duration (five cerebellar and thirteen elsewhere), the eye grounds were unchanged in three only. Doubtless a mild degree of internal hydrocephalus had developed during the months of illness.

One might add indefinitely to the evidence setting forth the importance of this sign in pressure cases. Enough has been said, we hope, to make it plain that ophthalmoscopic examinations should be made early and often whenever such pressure is suspected.

Intracranial fluid or cerebro-spinal fluid. Its relation to intracranial pressure and the significance of lumbar puncture.

It is now generally agreed that the cerebro-spinal fluid is secreted by the choroid plexuses, and augmented by the waste fluid products of nerve cell activity. While the quantity under physiological conditions may be minimal, as pointed out by Hill, yet the amount undoubtedly varies under varied conditions. Secreted by the choroid plexuses, the cerebro-spinal fluid is absorbed into the venous system, and, according to a good authority, this process repeats itself every four to six hours, thus demonstrating a fairly rapid movement out of and into the vascular system.

For the topic before us to-day we are concerned, however, only with the question as to the pressure signs available from lumbar puncture. Some men go so far as to say that lumbar puncture is the most valuable aid we have to-day in the diagnosis of the degree of intracranial pressure.

While admitting the truthfulness of this claim in many cases, we must not forget that the correct estimation of intracranial pressure by this means depends upon the *free communication* of the sub-arachnoid space in the lumbar region with the cranial ventricles—a condition often absent. Then the character of the fluid may appreciably alter the pressure signs, *e.g.* a fluid rich in cells, turbid fluid of cerebro-spinal meningitis. Nor is lumbar puncture free from danger. In long standing intracranial pressure cases, in shock, in tumour of the brain, especially those beneath the tentorium cerebri, the procedure should be cautiously undertaken and carefully carried out. Nausea, vomiting and headache sometimes follow the operation.

The relation of intracranial pressure to cerebral hæmorrhages, traumatic conditions, hydrocephalus and tumours will be discussed in detail by Dr. Garrow. A few observations, however, regarding intracranial tumours may be made in passing.

While it might appear reasonable that the space which a tumour takes up in the cranium would determine its influence on intracranial pressure, yet this is not the case. Often the brain substance is destroyed as the new growth progresses, and thus space is not encroached upon. As already pointed out, far more importance as symptom-producing causes are the changes in the circulation induced by the tumour, anæmia, thrombosis, venous stasis, internal hydrocephalus and cerebral œdema, by which sleeping states, convulsions, paralysis, intracranial pressure signs may be explained.

The cardinal or the typical features of intracranial tumour have long since been enumerated as headache, vomiting and optic neuritis, three prominent characteristic pressure symptoms. It has also been taught that along with these symptoms there was an increase in the

arterial blood pressure. Following this matter out over several years one fails to find evidence in support of this view. From a considerable number of case reports gone over recently in the Royal Victoria Hospital, in which a diagnosis of cerebral tumour was made, those whose ages varied from a few years to fifty years, no blood pressure was found beyond 130 systolic phase, while the brain often bulged in operation, and the cerebro-spinal fluid, showed a considerable degree of heightened pressure. It may also be stated that on two or three occasions, not including this series, there was found subtentorial tumour with the same degree of blood pressure. It is quite different, however, with the fundi-œdema, optic neuritis, venous engorgement and optic atrophy, are the terms describing the greater number of fundal conditions found in these cases. In a group of cases of meningitis whose duration, of course, was naturally much shorter than that of tumour, optic nerve involvement was rare, as already pointed out.

Increased intracranial pressure serves to explain more and more the symptoms associated with a large number of diseases, *e.g.* the acute infectious diseases, and from the evidence constantly increasing it seems probable that the quantity of cerebro-spinal fluid would explain at least a few of these symptoms. The work of Dixon and Halliburton, in 1913, showed that alterations in cerebro-spinal pressure exerted a marked action on cerebro-venous pressure, and established the fact that increased secretion of the fluid resulted in definite changes in its pressure. They are inclined to believe that a deficiency of oxygen or an excess of carbon dioxide in the blood is the greatest factor in stimulating the secretion of the cerebro-spinal fluid. The good results following upon lumbar puncture (even decompressive operations in cerebral œdema (Cushing, Rawlings) would favour the view that the cerebro-spinal fluid, under pressure, was at all events an important factor in the cause of many of the symptoms —headache, delirium, convulsions, dizziness, etc.

In 1908 Cushing concluded one of his papers by saying that in view of the marked improvement after cerebral decompression (in nephritis), this case adds further evidence to support the view that cerebral symptoms of uræmia are largely due to pressure from œdema of the cerebral tissue (*Am. Jour. Med. Science,* 1908). Severe headache and vomiting late in pregnancy, with head retracted and sleeplessness, have been relieved by the withdrawal of sterile cerebro-spinal fluid under great pressure (Gray, *Lancet,* Nov. 4, 1916).

Delirium, in seven severe cases of pneumonia, under treatment by Musser and Hafford, was promptly relieved by lumbar puncture (*Am. Jour. Med.,* Oct. 5, 1917).

Claude and Meuriot relieved all the signs and symptoms of cerebro-spinal hypertension, following a bruise in the neck, by repeated lumbar punctures. *Le Progrès Medical,* 1916, *Mingazzine,* II, Polclinico, July, 1917, advocates lumbar puncture in severe paroxysmal headache, with almost uniformly good results.

Rawlings (*B.M.J.,* May, 1918) claims that by lumbar puncture excess of cerebro-spinal fluid is demonstrated in cerebral œdema, seen in case of heat stroke, for which, in several instances, he has done a decompression operation by opening the cranium, with most satisfactory results.

Treatment

A prospective field for therapeutics is opening up as one learns more of the source and the agents which influence the secretion of the cerebro-spinal fluid.

Generally speaking, however, it appears that there is but little that can be done by the internist beyond the use of lumbar puncture. Even this has a limited sphere of usefulness up to the present. It seems, however, that this method must become increasingly useful, particularly in cases of meningitis of the serous type, in œdema of the brain, from whatever cause, attention being given, of course, to this condition arising if an intracranial tumour complicate the case; in toxæmia such as uræmia or alcoholism, or plumbism, not to speak of those essential headaches, so distressing and so intractable.

It must be admitted by all that the more one studies the subject, the greater is the promise which surgery gives for the relief, both in anticipation and in the actual crisis, of increased intracranial pressure.

Summary

1. Intracranial pressure signs and symptoms depend upon the circulation in the brain.

2. Venous stasis and cerebral anæmia best explain these signs and symptoms.

3. The diagnosis in the less pronounced cases depends upon—

(*a*) general symptoms

(*b*) eye ground changes

(*c*) lumbar puncture.

4. It would appear in a certain number of instances—a number increasing with the number of observations—that the cerebro-spinal fluid, without developing internal hydrocephalus, may account for many symptoms.

5. In the non-inflammatory cases much relief is afforded by lumbar puncture.

PHYSIOLOGY OF THE INTRACRANIAN CIRCULATION

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Physical considerations.—The circulation through the brain has been recognised for long to be unique in comparison with that of any other organ or tissue in the body, with the exception of the bone marrow. Encased in the rigid cranium, the volume of the brain cannot, like that of other vascular areas, expand and contract in proportion to the changes in the blood supply; neither can the calibre of its blood vessels become altered, unless there is some special mechanism existing whereby a part of the cranial contents can be quickly expelled from and aspirated into the rigid case. In a general way, the physical conditions of the intracranial circulation are similar to those existing in a flask full of water and having a thin-walled rubber tube suspended in the water with its free ends connected with glass tubes passing through the stopper of the flask. If fluid be made to circulate through the tubing, no change in the calibre can be produced by altering the pressure of inflow; but the rate of discharge from the other end of the tube will be proportionate to the pressure. Although the tubing itself is readily distensible and elastic, these properties are entirely annulled by the incompressible fluid in which the tube is suspended.

If any expansion or contraction of the tubing as a whole is to occur, provision must be made for changes in the volume of fluid in the flask by inserting in the stopper a third tube connected with an overflow flask; and in applying this second model to represent the circulatory conditions as they exist in the brain, the question arises as to whether the cerebro-spinal fluid which lies in the large subarachnoid spaces at the base of the brain and in the ventricles, by communicating through the foramen of Magendie with the spaces surrounding the spinal cord, may not be capable of functioning as the overflow fluid. This is at least conceivable, especially when one bears in mind that some outflow is also possible along the sheaths of certain of the cranial nerves. Recent investigation has, however, clearly demonstrated that under normal conditions the amount of cerebrospinal fluid is too limited to make it of any significance in this connection.

Although it is therefore improbable that the vessels as a whole could expand or contract, it is still possible that some provision might

exist by which extra room could be made to allow of localised dilatation of certain parts of the vessels. The veins, for example, might contract in proportion as the arteries dilated and the possibility becomes all the more likely when we consider that because of the great capacity of the cerebral veins their lumina might be considerably constricted without any serious obstruction being offered to the blood-flow through them. Such a recriprocal dilatation and constriction of the proximal and distal halves of a thin-walled rubber tube suspended in water in a closed flask can be demonstrated, provided some resistance be inserted between the two halves. This resistance would be represented in the intracranial vessels by the capillary area. It is impossible to say to what extent this reciprocal mechanism between arteries and veins may prevail, but in any case it cannot well extend beyond the cerebral veins to the sinuses, since these are partly embedded in the cranium itself and are protected by relatively thick membrane on their free sides. Such a mechanism may be employed for permitting the arteries of a local area to expand, but it cannot obtain over any large area, since otherwise the total outflow of blood from the sinuses through the jugular foramen would be curtailed, which we know to be contrary to what actually occurs when the arterial pressure is raised, and which moreover would be highly detrimental, since it would cause self-strangulation of the intracranial bloodflow.

These physical considerations lead us to expect that there cannot be any dilatation or constriction in the intracranial vessels which is comparable with that which occurs in other vascular areas, although it may take place to a degree which is limited by the extent to which the cerebral veins can be passively contracted or expanded without curtailment of the blood-flow. Acting to this extent, the dilatation produced in the arteries by each cardiac systole accounts for the rise in pressure which occurs simultaneously in the venous sinuses (as measured in the torcular Herophili), but it is unlikely that the amount of blood supplying the brain will be determined by local dilatation or constriction of the blood vessels, as is the case, for example, in a glandule or muscle. Of this we are certain, that the total volume of blood within the brain case at any given moment can undergo no considerable change. Provision for more or less blood must therefore be afforded by changes in the velocity of flow.

We must now proceed to test these hypotheses by physiological experiment, for, if they are found to apply to the intracranial circulation, the conclusion becomes inevitable that changes in the total blood supply to the most important organ in the body are dependent not on

any local adjusting mechanism in that organ itself, but upon conditions prevailing in other parts of the body, with the possibility that a local vasodilatation of its vessels may be made possible by a secondary compression of neighbouring venules, or perhaps even by an active constriction of the arterioles of neighbouring inactive centres.

The questions of greatest practical importance are, therefore, as follows: (1) What determines the intracranial pressure, and how does this vary during each heart beat? (2) If there can be no change in the actual volume of blood in the vessels as a whole, what provision is made to provide changes in blood supply with varying degrees of activity of the brain, and how are these changes brought about? (3) Is it possible, without change in the total volume of blood in the brain, for certain vascular areas to expand at the expense of others that correspondingly constrict?

The pulsations of the brain and the cause of intracranial pressure. Examination of the fontanells in an infant's head or the surface of the brain exposed by trephining shows distinct pulsations; but that does not prove that similar pulsations occur in the intact brain case, for the absence of a part of the cranial wall might be responsible for the pulsation. The presence or absence of pulsation must be sought for in the still rigid brain case. This has been done by closing a trephine hole by a glass window through which the cranial contents can be seen when strong illumination is used: pulsations of the vessels are clearly visible. To determine the exact relationships of the pulsations, the trephine hole is connected with a delicate recording tambour by screwing into it a brass tube closed at its inner end by a thin rubber membrane. It has been found that the arteries expand somewhat with each cardiac systole, and that there are further expansions with each expiration, but not with inspiration, as is the case in other vascular areas. The room for the cardiac expansions is no doubt provided mainly by compression of the cerebral veins, thus causing the blood within them to exhibit corresponding waves of pressure. The room for the exspiratory expansion is possibly provided in part at least by movement of cerebro-spinal fluid into the spinal canal. The reason why expiration and not inspiration causes the increase in volume is that there are no efficient valves between the right side of the heart and the cerebral veins. This allows the expiratory rise in venous pressure which is well known to occur in the former to be directly transmitted to the brain.

This brings us to the second part of our first question: What determines the intracranial pressure? To answer it we must know something of the method by which the pressure is measured. This

has been most successfully done by Leonard Hill, who devised an instrument called the cerebral-pressure gauge, consisting of a brass tube closed at one end by rubber membrane and screwed into a trephine hole. The outer end of the tube is joined to a narrow glass tube connected with a pressure bottle. The whole system is filled with fluid except for a minute bubble of air in the narrow glass tube. Any changes in pressure in the brain cause corresponding movements of the bubble, and the magnitude of the change is measured by readjusting the pressure bottle so as to bring the bubble back to its original level. It has been found that the pressure may vary from zero to 50 mm. Hg. (as in strychnine convulsions), and that these variations depend entirely on circulatory conditions, there being no compensatory mechanism by which the pressure is kept constant. The brain continues to functionate in normal fashion independently of pressure. The average pressure under normal conditions is 100 to 130 mm. H_2O.

The intracranial pressure varies directly with the venous pressure within the skull, and only passively follows changes in the pressures in the arteries and veins of the systemic circulation. This implies that the efficiency of the cerebral circulation will be dependent very largely upon alterations in the capacity of the splanchnic area, the greatest reservoir of blood in the body. By actual measurement it has also been found that—

1. The pressure within the lateral sinuses of the brain (measured by connecting a tube and manometer with the torcular Herophili) varies absolutely with the intracranial pressure. It therefore exhibits pulsations which mirror precisely those observed in the cerebral pressure gauge.

2. Both these pressures passively follow changes in the pressure in the right auricle. They also run more or less parallel with changes in arterial pressure, and there is never any change in either of them which cannot be traced to some general circulatory condition.

The reason why the intracranial venous and the intracranial (cerebral) pressures do not vary absolutely with the arterial is that they "are equal to the arterial pressure minus the unknown resistance which opposes the tension of the vascular walls on the arterial side" (Leonard Hill). This elastic tension is so great that it reduces the pressure to millimetres of water instead of millimetres of mercury.

A few of the many experiments performed by Leonard Hill and others will serve to prove these far-reaching conclusions—

1. In asphyxia produced by cessation of the respiratory movements in a curarised animal, the cerebral venous pressure at first falls with

fall in the systemic pressure and then rises as the arterial hypertension sets in. In the last stage, however, although the arterial pressure is quickly falling, the venous pressure rises and with it the cerebral venous pressure.

2. During administration of ether, alterations in cerebral pressure become marked only when there is extensive muscular movement or hyperpnœa. Chloroform, on the other hand, by acting more directly on the heart so as to produce a fall in arterial and a rise in venous pressure, causes at first a decided rise in cerebral pressure, and later a fall following the development of decided arterial hypotension.

3. Amyl nitrite injected into the jugular vein causes at first a rise in venous pressure and therefore in cerebral pressure. Later, however, marked arterial hypotension develops, and the intracranial pressure declines.

4. During epileptic fits induced experimentally by excitation of the cortex, there is a rise in venous pressure and correspondingly in intracranial pressure. In the more violent convulsions produced by absinthe, however, there is very little change in systemic venous pressure, while the arterial pressure shows extreme variations, with which the intracranial pressure runs parallel. With adrenalin, where both arterial and venous systemic pressures rise enormously, there is, of course, a great rise in intracranial pressure, and there is never any local change in the latter which would indicate that this potent drug had locally caused these vessels to constrict.

5. The alterations in systemic pressure induced by the operation of the force of gravity and coming into play when the position of the body is changed, if not perfectly compensated for by constriction of the splanchnic area, will cause corresponding changes in the intracranial tensions. Under the influence of gravity, for example, the intracranial and the intracranial venous pressures may fall below zero.

It is important to note here that the pressure of the cerebro-spinal fluid does not absolutely correspond to the intracranial pressure, partly because this fluid is really a secretion produced by the choroid plexus, and partly because it is readily absorbed either by returning to the venous blood through the Pacchionian corpuscles or by leaking away through the spinal cord and nerve sheaths. As evidence accumulates, the significance of this fluid in a physical sense—that is, as a fluid which may become adapted in amount to accommodate the blood supply—becomes less and less insisted upon; its function being rather that of a nutritive or lubricating fluid.

The comparatively slight amount of extra room which can be pro-

vided in the cranial cavity by compression of the venules and capillaries has suggested to some writers that a self-strangulation of blood-flow might occur when the pressure suddenly rises in the basal and cerebral arteries. The increased pressure would be transmitted undiminished through the incompressible brain substance to the thin-walled vessels and compress them because of the lower pressure within. This is the truth but not the whole truth, for if these theorists had carried their reasoning a little further, they would have seen that any curtailment in blood-flow through the venules and capillaries could only be transitory, since the compression would be overcome by the arrival of the pressure wave through the blood stream itself. For it is obvious that the arterial pressure transmitted directly must be greater than that pressure after it has overcome the tension of the arterial wall and is transmitted to the venules through the brain substance. Whenever this readjustment has occurred, the cerebral vessels become expanded to the greatest extent possible and they become virtually rigid tubes comparable with the rubber tube suspended in water in a closed flask, as in the *schema* referred to at the beginning of the lecture.

These adjustments having been made, the only variation in intracranial blood supply which can occur is one affecting the velocity of flow, or if you prefer the term, the mass movement of the blood; the volume cannot change. After all, however, that is what is necessary to meet the demands for more blood, and the conceptions which have been formed by studies on expansible vascular areas, such as the kidney and spleen, that increased blood supply runs parallel with increased volume, do not apply.

That the mass movement of the blood in the cranium increases when the arterial pressure rises has been shown by direct experiment. Hill and Nabarro found it increased from two to six times during the convulsions produced by absinthe.

Local readjustments of blood supply in different parts of the brain. Limited though any change in calibre of the cerebral arteries can be, it is nevertheless sufficient to make it possible that local variations in blood supply might occur as a result of active constriction or dilatation of the vessels. Just as the blood supply of a muscle or gland may be varied independently of any change in general blood pressure by local changes in the calibre of its blood vessels, so might that of the brain be varied, and this might occur to a limited extent for the supply as a whole, as by constriction of the circle of Willis, or to a greater extent in one or other of the arteries which spring from the circle. By the latter adjustment a greater blood supply might be directed into an

area which had become especially active, the flow to other relatively quiescent areas being meanwhile somewhat curtailed.

These possibilities raise the question as to whether there are functionally *active vasomotor nerves to the cerebral vessels.* Histologists have definitely demonstrated nerve fibres running on to the cerebral vessels, especially by the use of the *intra vitam* methylen blue method of staining (Huber, Hunter, etc.), but this does not of course necessarily indicate that the fibres normally cause the arterial muscle to expand and contract. The only basis upon which such a claim could be put forth is an actual demonstration of changes in intracranial blood-flow occurring independently of changes in systemic arterial or venous pressures. Leonard Hill and Bayliss and later Leonard Hill and Macleod have most diligently sought for such evidence, but with entirely negative results. In a typical experiment records were taken of the intracranial pressure, the cerebral venous pressure and the pressure in the circle of Willis (by a cannula inserted in the peripheral end of the internal carotid artery), as well as the arterial and venous pressures in the systemic vessels (carotid and jugular). Since any vasomotor fibres must presumably be derived from the vasomotor centres, and since these fibres must gain the cerebral vessels through the stellate ganglion and ultimately travel into the cranial cavity along the outer coats of the arteries, the above pressures were simultaneously observed before and during electrical stimulation at these places. It was found that any change that did occur could invariably be attributed to changes in the circulation as a whole, there was never any alteration in pressure locally in the brain for which the occurrence of local constriction or dilatation of the vessels had to be assumed.

Other observers have attempted to investigate the problem by measurement of the volume of blood leaving the brain, but with similarly negative results.

But an objection can be raised to these experiments on the ground that there might be feebly acting vasomotor influences, the effect of which would become entirely masked by the much more potent influence exerted on the blood-flow by changes in the circulation as a whole. As pointed out by Wiggers, the only way by which local changes in the blood-flow through the intracranial vessels can be expected to reveal themselves is by measuring the entire outflow, a measurement which, however, it is impossible to make in an intact animal on account of the many pathways through which the venous blood can leave the skull. Measurement of the outflow by one of them does not by any means indicate the magnitude of total outflow. To overcome these difficulties, Wiggers proceeded to measure the outflow from all the

cranial vessels of oxygenated Locke's solution perfused into the cerebral arteries under constant pressure. It was found that the otherwise constant rate of outflow became decidedly curtailed when adrenalin was added to the Locke's solution. If we assume that this drug acts only on arterial muscle having functionally active vasoconstrictor nerves, then the result would prove the presence of such fibres to the cerebral vessels, but even granted this, the result does not warrant the conclusion that, under normal conditions in the intact animal, such fibres display any activity. Wiggers does not claim that his results prove that a local vasomotor mechanism is important, but thinks that "they are favourable to the view that cerebral vaso-constrictor nerves are present."

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THE TRAIL OF THE MEDICAL VAMPIRE

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It may seem a little strange to you that I should, as a layman, with no special knowledge of the healing art, undertake to talk to a representative body of physicians upon such a subject as patent, or proprietary, medicines. If I am somewhat familiar with this art of quackery, it is because of the connecting link between journalism and patent medicine advertising. It is not my purpose to attack personal tastes or habits. If people choose to drink Mrs. Winslow's Soothing Syrup for the laudanum it contains, or Tanlac for the uplift it may give one, fully realising what they are doing, that is their business and not mine. But the baby is not knowingly making a choice of laudanum, nor does the average woman realise that the chief medicinal property of Tanlac is alcohol.

If patent medicine makers told the truth, the whole truth and nothing but the truth in respect to their concoctions, there would be no need for me to stand up and address you gentlemen. It is the lies, the misrepresentations, *the holding out of false hopes* with which I will deal. The patent medicine business is *founded on a knowledge of human nature coupled with the making of false statements.* Were they to tell the truth there would be little or no sale for their "cures." I will illustrate: There was Munyon and his alleged remedies. Munyon's Asthma Cure as an example. Do you suppose that had he told the truth about his precious remedy, told the public that it was *composed of sugar and alcohol,* that it would have had a large sale as a sure cure for asthma. It is obvious enough that Munyon would not have died a millionaire if he had been obliged to tell the truth, and, incidentally, many thousands of people suffering from asthma would probably have found real relief from some legitimate source.

At this point I cannot refrain from recounting some of the incidents having to do with the career of another individual, who thrived much as did Munyon, and who also passed on a few months ago. I refer to Dr. Hartmann, of Peruna fame. There never, perhaps existed a concoction that had the popularity of Peruna. But a few years ago, Peruna sold in carload lots. It was to be found in the medicine closet of something like 50% of householders of the continent. But along came the United States government, and overturned Dr. Hartmann's happy schemes. The doctor was informed by the United States government's excise department that, *unless he*

introduced some drugs into his Peruna, the United States government would *only* allow it to be sold in places licensed to sell alcoholic liquors. So it was that Dr. Hartmann chose what he considered the least of two evils, and *put laxative* in his mixture. Too late, however, he discovered that it was *not* laxative Peruna drinkers wanted, but booze, disguised under a medical label. Those who had been accustomed to taking their toddy under the name of Peruna, good old Peruna, found themselves in for a *bad quarter of an hour* when they attempted to obtain the accustomed stimulation. The inevitable happened, the sale of Peruna fell off enormously, but not, however, until Hartmann had amassed a huge fortune.

In respect to this particular "medicine," a well-known health official once to me said, jokingly, "Let us go into the patent medicine business. Let us buy some cheap, Italian vermouth, some gin and bitters. Let us mix three parts of vermouth to two of gin and put in a dash of bitters. Then we will bottle this up in short quarts, give it a fancy name and a fancy price, and advertise it to cure falling hair, fever and ague, bunions, dyspepsia, and anything else you can suggest; and we can make a fortune selling it to the temperance trade."

"Sounds like a cocktail to me," I replied.

"So it is," said my friend; "but it is just as much a medicine as Peruna—and not so hard to take."

Before leaving Hartmann and going on to other matters, I will refer briefly to his booklet, "The Ills of Life." This was a sort of a house organ utilised to popularize Peruna, and it might be read with interest, if not with profit, by the entire medical profession. For instance, it told us that Peruna would cure catarrh. It then went on to describe what catarrh is. You gentlemen may be surprised to know that pneumonia is catarrh of the lungs, consumption is also catarrh, dyspepsia is catarrh of the stomach, Bright's disease catarrh of the kidneys, and last, but not least, appendicitis is catarrh of the appendix. It may be of interest to the medical profession to note that this old fraud was a graduate physician, and I am told, a very able one, before he took up the Peruna business, so it was not ignorance that led him to make these absurd and fraudulent statements. Statements which were unquestionably believed by millions of ill-informed people who liked the idea of buying disguised liquor at the druggist's.

I will content myself with citing one more instance of impudent misrepresentation, before taking up another aspect of the "case against patent medicines." This had to do with a concoction known as Nature's Creation, and in which I, personally, had a hand in forcing out of business under the False Advertising Bill, it being the first

conviction registered in Canada under this act. The Nature's Creation Company originally did business in Columbus, Ohio. It afterward moved to Michigan and then on to Toronto. It is interesting to note that Nature's Creation was originally advertised to cure blood diseases (notably, syphilis), but not being a financial success, the literature was switched, though the formulæ was unchanged, and it was launched in Canada as a cure for tuberculosis. It sold at $5.00 per bottle, and, according to the testimony at the trial, cost about 25 cents per bottle. An analysis showed that the stuff contained a few simple drugs, none of which would cure anything, not to speak of curing a disease incurable, so far as drugs are concerned. A conviction was registered against these people, and Nature's Creation, as a cure for tuberculosis, was forced to abandon business. It is interesting to note in connection with this case that the company in its defense gathered in numerous witnesses, who testified to the benefits derived from the stuff; and, I have no doubt that some were genuinely convinced that it has a curative value. *So much for the power of suggestion.*

I have taken up these three outstanding medical frauds merely to illustrate what it is possible to do when the manufacturer of a patent medicine is in no way hampered by the truth in respect to his advertised claims for it. The patent medicine business, taken as a whole, is inherently and inately fraudulent. It is a calculated method of obtaining money by false pretenses. Its very character makes it so. How many would buy Dodd's and Doan's Kidney Pills if they were not advertised to cure Bright's disease? How many would buy Swamp Root for their kidneys, if advertised to contain, as it does, only alcohol, sugar, water, flavouring matter and a little laxative? How many would sluice their insides with Buffalo Lithia Water did they know that there is more lithium in the waters of Lake Ontario? What man's wife would buy Mayatone at 75 cents a small package, with the hope of renewing the soft, velvety skin of her youth, if told that it was 90% Epsom salts and 10% borax, with a little perfume thrown in? Perforce, the patent medicine man must overstate his case, else the "suckers" would not rise to the bait. The bigger the liar, the more successful the nostrum seller.

One of the most pernicious frauds imaginable is the mail order business by which deaf people are presumed to be made to hear and the sightless to see, the maimed to walk and incurable maladies cured. In order to get a good start in this business, one must first obtain *a diploma.* These can readily be had for a trifle from such high-sounding institutions as the *Carnegie University of Wilmington, Delaware,* the *American Health College of Cincinnati,* and the like. London *Truth*

once said that it was easier to start a university in the United States than it was a grog shop in England, and I can well believe it. Having picked the institute, one may open up correspondence by mail, and, having answered some questions, also, by mail (one could not fail to answer them correctly, as both the questions and answers are on printed forms and before the applicant), the diploma, duly signed, sealed and witnessed, is forwarded. Of course, the payment for the same, $50.00, with or without trimmings, has already been forwarded. This is a cash business. Next an office is hired on a back street, but one is very careful that the letterheads and other stationery contain the picture of the best-looking business block in the city. Of course, you do not state that your office is *not* contained in this business block, nor, on the other hand, do they deny the soft impeachment. Next, you purchase, or rent, what is known in the trade as a "sucker list." This, of course, after you have decided in what line you will specialise. The sucker list is simply the names and addresses of some thousands of prospective customers, deaf or blind people, victims of nervous debility, and the like. These letters are even sorted as to nationality. The suckers are then written to, usually addressed as "Dear friend," with the word "Confidential" in a prominent position. When this is all done, you have made a fair start to cure up the universe, no matter what is the matter with it.

It may be interesting to you to know how these "sucker lists" are obtained. Once a person has written to a patent medicine company or a quack healer, the name and address is never lost track of. They are carefully compiled, tabulated, and ready for business. These names are dealt in to a surprising extent, and it is not at all unusual for a name brokerage house to advertise for sale as many as a half million names under, possibly, a dozen or twenty headings, such as asthma letters, kidney letters, dyspepsia letters, deaf letters, heart letters and the like. This explains the reason why, once on the "sucker lists," a person continues to receive for years through the mails all sorts of "come-on" literature.

The explanation of how people rise to this bait to the extent of giving to persons unknown to them intimate details as to their state of health, etc., is that ever-present human characteristic of hoping to get something for nothing. Thus it is that "free treatments," "tell us your symptoms and we will prescribe free," and all that sort of thing is ever reaching a new class of readers that rise readily to the bait.

I have described some of the coarser, cruder schemes of the patent medicine game. There are, of course, many other and more subtle forms of relieving the public of its money. For instance, there are the innumerable headache remedies that are advertised as harmless,

but which are heavy with caffein and phenacetin; and, I may say in passing, that my experience has shown me that an astounding proportion of women in this high-tension age are utilising such stuff for their daily cocktail. Then, there are flesh foods and things to make you fat, and other things to make you thin, and so on through a list that would take hours to discuss.

I now come to the point of asking what is the remedy for all this? There is one. There must be one.

It is estimated that the United States spends a hundred million dollars annually on patent medicines. I may say, in passing, that, according to Tanlac advertisements, that company boasts of selling in the United States more than nine million bottles of their concoction in three years, and it costs the user a dollar a bottle, plus the war stamp. The same company sold through one Toronto drug house twenty-two thousand bottles of this "bracer" between July, 1917, and the turn of the year. It is estimated that Canada's dope consuming public drinks yearly about $8,000,000 worth of patents.

The cure for this astounding waste of both wealth and health is not far to seek. Cut out their publicity. Advertising is the aggressive force ever fighting for these frauds. Advertising experts will tell you that 90% of the earning capacity of the prominent nostrums is represented by their advertising. No quack medicine could live without advertising; and the good preparations—and there are such, as every physician knows,—can, and do, continue to do business without the aid of the printing press, and the distribution of lying literature.

It is useless to hope that the press of this continent, with a few outstanding exceptions, will whole-heartedly enter into a campaign for the extermination of the patent medicine faker. They will, and do, contend that the case against the patent medicine man has never been proven. They will continue to print the questionable testimonials of Nuxated Iron, and such stuff, until the law intervenes—if it ever does. The explanation is—they need the money.

What could be more paradoxical. Here, in Ontario, we make a law prohibiting the advertising of our native-grown wines. Our wine-growers, under the present law, cannot send out a circular or a letter asking their customers for an order, or even describing their wares. But, at the same time, our public prints fill their columns with the advertising of patent nostrums, which run the gamut from the useless to the deadly.

In conclusion, I may say that sickness and suffering will continue to be exploited for the sake of gain until such bodies as yours become active and make themselves felt at governmental headquarters. It is only thus that the slimy trail of the medical vampire can be cut.

A CLINICAL STUDY OF FOUR HUNDRED PATIENTS WITH BRONCHIAL ASTHMA

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My aim in this paper is to present as many useful facts as possible in the determination of the cause and the treatment of bronchial asthma. These facts which have been obtained from a study of 400 patients with bronchial asthma may all be used to advantage by you in general practice.

The cases were about equally divided between the two sexes; there were 198 males and 202 females in the series. The nationality of the patient played no part in the cause or the frequency of the disease; so-called neurotic races, as for instance the Jewish race, were no more prone to asthma than other nationalities. Occupation, as a rule, played no part in the cause or frequency of asthma, however, occasionally occupation did have a bearing upon the cause of asthma. For instance bakers frequently have bronchial asthma from the inhalation of the flour with which they work. Two unusual instances where occupation bore a direct relationship to the cause of asthma are sufficiently interesting to mention. A man whose work consisted of sifting green coffee beans became sensitised to the protein in the green husks and had asthma from the protein. Another man whose work was that of a jewel polisher became sensitised to the protein in the dust from the boxwood with which he polished the jewels. An enquiry also should be made always in regard to the presence of pet and domestic animals at the patient's home, and where he works.

The mode of onset of asthma or the symptoms preceding asthma have little bearing upon the cause since in the majority of cases the onset is with what the patient calls a cold or bronchitis. Frequently these colds and attacks of bronchitis are not such in the sense of a disease or an infection, but, instead, they are the first symptoms of sensitisation to some protein, and months elapse before the physician realises that the patient has asthma; and the association of eczema with bronchitis and asthma is of considerable importance, since such patients are frequently sensitive to some type of protein, and the younger the patient is when these conditions manifest themselves the more probable it is that the patient is sensitive to some food protein. This is especially true in infancy.

The time of the year at which the patient began to have asthma, and the season of the year, if it always limits the attack of asthma, is

important. Attacks of asthma which occur only during the summer months are usually caused by the protein in the pollen of plants. In many instances this summer type of pollen asthma is prolonged throughout the year by bacteria which, because of the patient's lowered resistance, cause a bronchitis, and, this in turn, causes asthma. In a few instances the early type of summer asthma is due to bacteria rather than to pollens. A number of patients have asthma only in the early spring (March and April), and in the late fall (October and November), and these patients associate asthma with the changeable weather; in such cases bacteria are frequently the cause. Some patients have asthma only in the winter months when the air is clear and cold and bacteria are again the cause.

The length of time that a patient has had asthma is important, since one must bear in mind that the longer one has asthma the more pronounced may be the resultant bronchitis and emphysema, so that the asthma may not be relieved by removing the offending cause but the bronchitis must also be treated. The age of onset of asthma is most important, but before we go into this we must define sensitisation, and outline the methods of testing a patient to determine whether he is sensitive or not.

When a person is sensitive or anaphylactic to a particular substance, ill effects or certain symptoms are produced in that person by the entrance of that substance into his body. One type of ill effect or symptom is an attack of bronchial asthma. We also know that it is the protein element in that substance that causes asthma, and we must not lose sight of the fact that proteins are most widely distributed in nature. Therefore patients may be sensitive or anaphylactic to proteins and if so these proteins may be the cause of bronchial asthma. Proteins enter the body by inhalation, by ingestion, by absorption and by infection. Inhalation takes place through the respiratory tract and chiefly concerns the protein in the pollen of plants, in the emanations and hair of animals, in the flour of cereal grains and in some kinds of dust. Ingestion has to do with the protein in food and we know that foods after entrance into the gastro-intestinal tract do cause asthma. Absorption apart from inhalation and ingestion concerns the conjunctivæ and to a less extent the skin. By infection we mean the presence of pathogenic bacteria in any part of the body but more especially foci of infection located in the teeth, tonsils, nose, throat, and lungs. In the case of bacteria we have to deal with the protein element as well as with the infection element.

There are several ways of testing a patient in order to determine whether or not he may be sensitive to proteins. One commonly used

method is known as the intradermal test, which in our experience has proven to be too sensitive, and too delicate, if not erratic. The test which has proven to be safe and reliable as regards hay fever and asthma is the skin or cutaneous test, which is performed as follows: A number of small cuts, each about one-eighth of an inch long, are made on the flexor surfaces of the forearm. These cuts are made with a sharp scalpel, but not deep enough to draw blood, although they do penetrate the skin. On each cut is placed a protein and to it is added a drop of tenth-normal sodium hydroxide solution to dissolve the protein and to permit of its rapid absorption. At the end of a half hour the proteins are washed off and the reactions are noted, always comparing the inoculated cuts with normal controls on which no protein was placed. A positive reaction consists of a raised white elevation or urticarial wheal surrounding the cut. The smallest reaction that we call positive must measure .5 cm. in diameter and any smaller reactions are called doubtful. Negative skin tests with proteins rule out those proteins as a cause of asthma and all proteins which give a positive skin test should be suspected as a cause of asthma. In a case of bacteria, however, the skin test has to do only with the protein element, so that even though bacteria give a negative test, they may be a cause of asthma through their infectious nature, and the patient need not be sensitised to bacterial protein.

Of the 400 cases studied, 191 or 48%, gave a positive skin test and were therefore sensitive to some protein. According to sex, 53% of the sensitive cases were males and 47% were females, and of the total number of males studied, 51% were sensitive, and of the total number of females, 44% were sensitive. Therefore, although the prevalence of asthma between the two sexes was about equally divided, the percentage of sensitive cases was a little higher among the males than among the females. While considering the above percentages of sensitive cases it should be borne in mind that doubtful and slightly positive skin tests are not being counted; only those reactions which were a distinct urticarial wheal measuring .5 cm. or more in diameter are included, so that the number of sensitive cases is computed on a very conservative basis.

The following table is presented in order to show the importance of the age of onset of bronchial asthma In the first column the age of the patient is divided into five-year periods, with the exception of the first five years of life, which is subdivided into two periods, namely under two years of age which corresponds to infancy and between the ages of two and five. Other columns by following across the page on a line with the age of onset show respectively the number

of cases, the percentage of cases, the number of sensitive cases, the percentage of sensitive cases and the number of cases sensitive to the proteins which are found in the four principal sources, namely animal hair, food, bacteria and pollens at that particular age of onset of asthma:

Age of Onset of Asthma.	No. of Cases.	Per cent. of Cases.	No. Sensitive.	Per cent. Sensitive.	No. Sensitive to Protein in			
					Animal Hair.	Food.	Bacteria.	Pollen.
Under 2 years	34	9.	28	83.	19	23	5	15
Between 2 and 5 years	30	7.5	27	90.	14	9	2	6
" 5 " 10 "	37	9.	15	40.	12	5	2	15
" 10 " 15 "	35	9.	24	70.	6	5	5	13
" 15 " 20 "	26	6.5	14	54.	8	5	2	5
" 20 " 25 "	42	10.	22	52.	6	7	2	12
" 25 " 30 "	35	9.	17	49.	7	1	5	9
" 30 " 35 "	43	10.	21	49.	3	4	5	9
" 35 " 40 "	52	13.	12	23.	2	5	4	3
" 40 " 45 "	37	9.	9	24.	1	4	1	3
" 45 " 50 "	9	2.2	2	22.	.....	.....	.....	2
" 50 " 55 "	11	2.7	.....	.....	.....	.....	.....	.....
" 55 " 60 "	6	1.5	.....	.....	.....	.....	.....	.....
Over 60	3	0.7	.....	.....	.....	.....	.....	.....
Total	400	....	191	48.	78	68	33	92

It is noted that about the same number of patients had their first attack of asthma at each period of years, with the exception that after the age of forty-five there was a great decrease, and after the age of sixty there were only three cases; it may be surprising to know that the number of cases who developed asthma under the age of two and between the ages of two and five was as great as at any other age. The relationship between the age of onset of asthma and the sensitisation of the individual is important. Of the patients who began to have asthma under the age of two, 83% were sensitive to some protein; of those whose onset was between two and five, 90% were sensitive; of those beginning asthma between five and ten, 40% were sensitive for each period; between the ages of fifteen and thirty-five, 52% were sensitive for each period; between the ages of thirty-five and fifty only 23% were sensitive; and after the age of fifty no patients were sensitive. The above statements may be summarised as follows: 83% of the patients who began to have asthma during infancy (under the age of two) were sensitive; during childhood or between the ages of two and fifteen, 66% were sensitive; during young adult life or between the ages of fifteen and thirty-five, 52% were sensitive; during middle

life or between the ages of thirty-five and fifty, 23% were sensitive; and none were sensitive when the age of onset of asthma was after fifty. Stated briefly, four-fifths of the patients who began asthma during infancy were sensitive, two-thirds who began during childhood were sensitive, one-half of those beginning asthma during adult life were sensitive and none were sensitive that began asthma after the age of fifty; as the age of onset of asthma increases the frequency of sensitisation decreases, and the knowledge of this is a great help in practice.

The relationship between the age of onset of asthma and sensitisation to different types of protein is also very important. In the table, it is noted that nineteen patients, who began to have asthma under the age of two, were sensitive to animal hair proteins; of this number, ten were sensitive to the proteins of horse hair alone, one to cat hair alone and the other eight patients were sensitive to the proteins of the hair of horse, cat and dog, although they were more sensitive to the hair of horse than to the hair of the cat or dog. Of the patients whose onset of asthma was between the ages of two and five and between five and ten, fourteen and twelve patients, respectively, were sensitive to the proteins of animal hair, and in each instance eight of these patients were sensitive to horse hair proteins. Succeeding ages of onset of asthma show a gradual decrease in the number who were sensitive to animal hair protein. Sensitisation to food proteins was by far most frequent among those patients who began to have asthma during infancy. Of the twenty-three patients, nine were sensitive to egg protein, eight to the cereal grains and three to milk. Of the nine patients who began asthma between the ages of two and five and who were sensitive to food proteins, two were sensitive to egg and five to cereal grain proteins. Succeeding ages of onset of asthma show about a constant average of frequency in the sensitisation to foods, but the frequency of sensitisation to egg, milk and cereals is much less than for other food proteins such as fish, meat and potato.

The frequency of sensitisation to the bacterial proteins was about the same for all ages up to forty years. More patients were sensitive to the protein of Staph. pyog. aureus than to any other type of bacterial protein, however, sensitisation to the protein of Staph. pyog. abus and the various streptococci was sufficiently frequent to warrant routine tests with these. In the above table the number of positive reactions with bacterial proteins is too conservative since many definitely positive reactions which do not measure .5 cm. in diameter are obtained.

It is of interest to note the effect of occupation on sensitisation after the age of forty. Of the eleven patients who became sensitive

to protein after the age of forty, four were bakers, and were sensitive to wheat protein; one was a hostler, and was sensitive to horse dandruff protein; and another, who was a sifter of green coffee beans, was sensitive to green coffee protein—therefore, in over half of these cases occupation was responsible for the cause of asthma.

In the table it is noted that seventy-eight patients were sensitive to the protein derived from animal hair. Of this number, forty-three were sensitive to hair alone, five to cat hair alone, three to feathers alone, two to cattle hair alone, one to wool alone; the remaining twenty-four patients were all sensitive to horse hair in combination with either dog hair or some of the other types of hair. Therefore, of animal emanations, the protein of horse hair is by far the most frequent cause of asthma and the hair of the dog is the least frequent cause of asthma.

Of the sixty-eight patients who were sensitive to the food proteins, thirty-five were sensitive to the cereal grains and of these thirty-five, twenty-five were sensitive to wheat alone, three to corn alone, two to rice alone, and the remaining five patients were sensitive to all the cereal grains. Among the thirty-three remaining food cases, thirteen were sensitive to egg, five to casein, eight to fish, and seven to potato; an occasional patient who was sensitive to one of these types of proteins was also sensitive to some other food protein such as beef, chicken or spinach, but sensitisation to foods other than those already mentioned was unusual. Therefore, one half of the food cases were sensitive to the proteins of the cereals, and wheat was by far the most common food to cause asthma; next to wheat in frequency came egg, then fish, potato and casein were close thirds, and other foods were too infrequent to be enumerated.

Of the ninety-two patients who were sensitive to pollens, seventeen were sensitive to the early pollens and timothy was the chief one of these, forty-five were sensitive to the late pollens and ragweed was the chief one of these, and the remaining thirty patients were sensitive to both early and late pollens. Sensitisation to rose, red top, daisy and golden rod was infrequent.

There is one more important point which the above table illustrates, namely, multiple sensitisation, or sensitisation to more than one type of protein. For instance, if we add together the number of cases who were sensitive to horse hair, food, bacteria and pollens we have a total of 272 sensitive patients, whereas, in reality, there were only 191 sensitive patients in the series. In other words some of the patients were sensitive to more than one type of protein. On consulting the table it is noted that multiple sensitisation is by far most

frequent among those patients who began to have asthma between the ages of two and five and between five and ten, but after these ages multiple sensitisation is not very usual. Since the majority of the patients in this series were young adults or older when tested, it is fair to assume that the longer a sensitive patient has asthma the more apt he is to be sensitive to more than one type of protein and sensitisation to one protein early in life and *vice versa,* non-sensitisation early in life is not so apt to be followed by sensitisation later on. Among the few infants which were tested in this series, multiple sensitisation was frequent.

A positive skin test with several different proteins may mean that all of them are causing asthma, or that only some of them are causing asthma at present, and that the others have been, or may be in the future, the cause or even it may mean that none of the proteins are at present the cause, but that they have been the cause, and now secondary infection is the chief cause of asthma. Treatment will naturally reveal the present cause. Suffice it to say that positive skin tests by proteins which seem to have no bearing on the cause of asthma should be considered as danger signals and not as false reactions; such positive tests should not be disregarded.

The treatment of sensitive cases is largely a matter of judgment in deciding which positive test should be first investigated. If the patient is sensitive to food proteins, such foods should be omitted from the patient's diet for at least a month in order to see what effect they have on the asthmatic condition. In this series of cases nearly all of such patients have been relieved of asthma. In a few instances, however, because of the associated bronchitis, autogenous sputum vaccine have been required in conjunction with the restricted diet. Attempts to desensitise the patient against offending food protein by the subcutaneous injection of or by feeding gradually increasing amounts of the protein have failed. We have reasons, however, for believing that total abstinance from the offending protein for a long interval automatically desensitises the patient for that protein.

Patients who are sensitive to bacterial proteins may be successful desensitised against such by treatment with vaccines of those organisms, but great care must be exercised not to give too large and too rapid an increase in the amount of vaccine. The first dose of vaccine should not be larger than one-hundred million bacteria, and each succeeding dose should not be more than fifty million over the preceding dose.

Before treatment is undertaken for those patients who are sensitive to the protein of horse dandruff or hair and of pollens, skin tests must

be done, using various dilutions of these proteins. Treatment should be begun with the dilution next higher than that which gave a positive test; the first dose should be small usually .1 cc. and each succeeding dose should not be more than .1 cc. over the preceding one. These treatments may be given at five-day or seven-day intervals. The treatment of patients, who are sensitive to hair proteins, with the serum of that animal is of no avail and is very dangerous. Patients who are sensitive to pollen proteins should be treated in anticipation of the season. Occasionally it is necessary to use vaccines in conjunction with the animal hair proteins in order to benefit the associated bronchitis, but usually this is not the case.

Those patients who show multiple sensitisation that is those who give positive skin tests with many different types of proteins are the most troublesome to treat; in such cases treatment is a matter of judgment. Not an unusual case is one who gives positive skin tests with the proteins of wheat, horse hair and pollens. Naturally wheat should be omitted from the diet anyway, and if the patient is exposed to horses, treatment should be given with the horse hair proteins; in fact such treatment is advisable since the patient may be at any time so exposed, and in anticipation of the pollen season the patient should be desensitised against these. Thus all possible known causes will be eliminated. Even then autogenous sputum vaccines may be required.

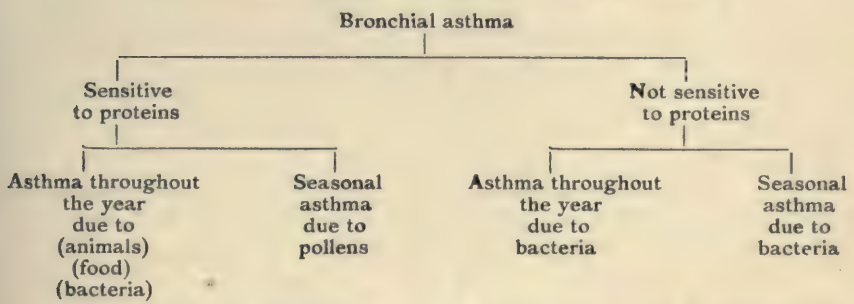
The results of dieting in those sensitised to food proteins and the results of treatment with animal hair, pollen and bacterial proteins in those so sensitised have been most successful. And in those patients who have not been relieved by such treatment, autogenous vaccines have been of much benefit. The permanency of relief depends upon the amount of treatment and the patient's power of resistance.

The non-sensitive patients, or those who fail to give positive skin tests with proteins, may be disposed of in a few words since there is little to guide us in the cause and treatment of asthma. Occasionally the serum of such patients positively agglutinates some type of organism, and treatment with vaccines of that organism frequently benefits their asthma. The non-sensitive patient usually presents the symptoms and physical signs of bronchitis, he gives a history of persistent cough between attacks and there are râles in the lungs between attacks. Often these patients are relieved or greatly benefitted by autogenous vaccines consisting of the predominating organism in their sputum. These vaccines are prepared as follows: thick sputum, which is raised after a paroxysm of coughing, is washed repeatedly in sterile normal saline, and a portion is streaked on large surfaces of plain agar, and another portion is shaken and macerated in dextrose bouillon from

which tubes of blood agar are inoculated and plated. The plain agar facilitates the identification of some organism, and the blood agar identifies the various types of streptococci. The most satisfactory results follow treatment with the predominating organism. The largest number of patients have been relieved by vaccines of Staph. pyog. aureus, streptococcus hæmolysans and diphtheroid organisms when these have been the predominating ones isolated from the sputum. Other organisms may predominate and cause asthma. For instance, one patient has been relieved by an atypical type II pneumococcus, another by Friedländers bacillus, a few by an unidentified Gram negative staining bacillus, a few by Staph. pyog. albus and by streptococcus viridans; in each instance the predominating organism was the one used. Occasionally patients are troubled more from a catarrhal condition of the nose and throat than from cough, and in such cases it is often necessary to use vaccines made from these sources of infection. Naturally the teeth, tonsils and sinuses may be the seat of infection, and such foci, if present, should be attended to. In general, however, we are inclined to be very conservative in regard to operations as a relief for asthma and the possibility of sensitisation to proteins should first be ruled out.

We feel that the following is a good and useful classification to use in determining the cause and treatment of bronchial asthma:

Classification of Causes of Bronchial Asthma.


Bronchial asthma
Sensitive to proteins
Not sensitive to proteins
Asthma throughout the year due to (animals) (food) (bacteria)
Seasonal asthma due to pollens
Asthma throughout the year due to bacteria
Seasonal asthma due to bacteria

After what has been noted in this paper the above classification needs no description. Although neurasthenic, neurotic and psychoneurotic conditions are frequently associated with bronchial asthma, we feel that these conditions are not sufficiently often a cause of asthma to warrant a place among causes of asthma. Furthermore, no provision is made for so-called cardiac and renal asthma since we do not accept shortness of breath on exertion, nocturnal dyspnœa and bronchitis all of which are associated with cardiac and renal disease as bronchial asthma. The combination of all of these symptoms do, in a

way, stimulate bronchial asthma, but for such a syndrome we feel that the term asthmatic bronchitis is more appropriate; such a term would infer bronchitis with asthmatic symptoms, and this is really the true condition present. Cardiac and renal patients may have true bronchial asthma, however, in these cases the asthmatic condition is entirely separate from the cardiac and renal disease. They are two distinct conditions not dependent upon each other.

SECTION III

OBSTETRICS AND GYNAECOLOGY

THE REDUCTION OF INFANT MORTALITY DURING LABOUR, WITH SPECIAL REFERENCE TO THE NEWER METHODS OF CAESAREAN SECTION

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It has been impossible for me to discover how many full term viable children die in child-birth. Statistics, more or less reliable, are found scattered through the literature. Dr. McMurchy, of Toronto, quotes Dr. Amand Routh, of London, that infant mortality during the first year of life is equal to that in utero, including still-births. Dr. K. Pearson says that for every 1,000 babies born alive, 605 are still-born, and Dr. F. P. Mall believed one-third of the children were born dead. Winter, of Germany, says that 9,000 children die annually as the result of breech deliveries; and 4,000 per year for New York (about 1890). The figures given for Paris, Glasgow and Edinburgh are 9%, 13.6 %, and 11.5%, respectively. Cragin, at the Sloane Maternity, New York, in 9,769 deliveries, found 449 still-births and 389 infants died within the first two weeks, a total of 838, or about 8.6% mortality from all causes, which included syphilis and prematurity.

It is safe to say that in the United States there die annually, during birth, from all causes, 50,000 children. This includes premature children (not abortions).

The causes of these still-births may roughly be divided into those existing before birth, and those inherent in the process of delivery itself. It is manifestly impossible, in this paper, to name all the numerous causes of the death of the fetus during gestation; indeed the purpose of this paper does not concern them. The outstanding ones are, congenital anomalies of growth, syphilis, prematurity, but one other will be mentioned, the rôle of infection of the fetus, either via the blood stream from a distant focus, or, by contiguity, from a local source of infection near the uterus, preëminently the vagina. While not anent the subject, I bring this point out because of its

importance, and the fact that it is not, at present, sufficiently appreciated. The factors inherent in the process of delivery itself that cause the death of the fetus are also very numerous and cannot be fully discussed here. A few general observations, however, may not be out of place. It is highly important that an autopsy be performed on every child born dead, or dying shortly after birth. If this is done, our statistics will be purified, and many deaths ascribed to the forceps, or to version and extraction, will be found to be due to congenital deformities which make extra-uterine existence impossible, or to anomalies of the ductless glands, *e.g.* the thymus, the adrenals. I have reason to believe that labour, especially if prolonged, sometimes has a noxious influence on the child, either by altering its metabolism, or by deranging the action of the endocrine system, or in some other at present equally unexplainable manner, rendering it ill, or incapable of continued life. This belief is based on the observation of numerous cases, where the cause of fetal death could not be established, and yet the child presented symptoms which, in the adult, would have been ascribed to one or the other of the conditions mentioned. I have had several cases of acidosis in new-born infants. Most of these were after prolonged, or operative, deliveries, or those attended by asphyxia of the fetus; some few were from mothers suffering from acidosis; and a few in babies naturally and easily delivered. Several cases have indicated to me that the adrenal glands are especially vulnerable to the influences of labour. If you will give a moment's thought to it, and try to put yourself in the place of the child, you will agree with me that, for the infant, as well as the mother, labour is quite an ordeal, nervous as well as physical. That new-born children suffer from shock, I am certain. I have had several cases where the death resembled the "thymus death" of early infancy.

Every accoucheur of experience has had patients in whom successive children died during birth, and without apparent cause, discoverable either in the manner of delivery or at the post-mortem. In three such cases I have not cleared up the cause of the death of the previous ones.

Without question, some of the general diseases of the parents, like syphilis, alcoholism, plumbism, predispose the fetus unfavourably, so that it cannot stand the stress of even an easy delivery. Hæmorrhage into the fetal brain is certainly favoured by occult syphilis, and, perhaps, soon the other conditions, mentioned above, may be explained, as our knowledge of metabolism and the endocrinal glands becomes more definite.

Among the well-established causes of death of the fetus during its passage into the world certain ones stand out in importance because

of their frequency, and because by proper care they may be avoided and much child life thus saved. These are the ones with which this paper is particularly concerned. They are, prolonged labour; the injudicious use of forceps, or version and extraction; the abuse of pituitrin; placenta previa; eclampsia. Under prolonged labour are to be mentioned, obstruction offered by the soft parts, cervix, and pelvic floor, by contraction of the bony pelvis (much more common in our country than is generally believed), abnormal presentations and positions, especially occipito-posterior positions of the head, and face presentations.

At the same time that we consider the mortality of the child during labour, we must not forget the postponed mortality and the injuries, many of a permanent nature, which are frequently inflicted upon it by the natural powers, or and more readily, by operative procedure. Hæmorrhage into the brain, tentorium tears, fracture of the skull, dislocation and fracture of the vertebræ, joints and extremities often result from brutal deliveries. Minor injuries of brain, nerves and bones are very frequent, but often are overlooked until their later, permanent effects, attract notice, *e.g.* Little's disease from injury to the brain and spinal cord, chronic hydrocephalus, athestosis, idiocy, strabismus, deafness.

This brief glance into the subject shows the immensity of this particular field of preventive medicine, and I regret that I shall have time to discuss only a few of the means that we possess for the prevention of fetal mortality and morbidity.

1. *The Head Stethoscope*

In the conduct of natural labours most men neglect to listen to the fetal heart tones, and in cases of prolonged, obstructed delivery, this statement is but slightly less true. Yet we have not any sign that so surely shows us that danger threatens the fetus as does the state of its heart. It is, therefore, of the utmost importance that the accoucheur be cognisant, at every stage of the labour, of the exact condition of the child, and that he should at once detect any sign it may emit of distress. The ordinary stethoscope, of course, may be used to listen to the fetal heart, but there is a period of the child's journey into the world that is fraught with especially numerous and often acutely arising dangers. It is a critical hour. It is the second stage of labour, and particularly the thirty minutes just before the head is born. I feel sure, although I cannot obtain figures to prove the conviction, that thousands of babies are lost in this short interval before they reach safety. This statement acquires double force when applied to

cases of labour obstructed by rigidity of the pelvic floor, or contracted pelvis.

In order to render the ausculation of the fetal heart so facile that there can be no excuse for neglecting it, this stethoscope was invented. During the actual delivery of the child, the second stage, when one needs to listen to the fetal heart almost constantly (at least every two minutes) owing to the modern methods of asepsis and the attention demanded by the protection of the perineum, it is least convenient to do so.

During forceps operations, too, the child is much endangered from a variety of conditions. Unless the operator has a competent assistant, one skilled especially in hearing the fetal heart tones, many children die unobserved—and unnecessarily, since the means for saving them are so close at hand.

Furthermore, to relieve the listener of the necessity of looking at a watch, or having an assistant mark time, we have at the Chicago Lying-in Hospital, in each birth room a clock which strikes a bell every fifteen seconds. By counting the beats between two bells, the exact rate of the fetal heart is determined with the least modicum of trouble.

As occurs with the use of other instruments of precision, we discovered with this stethoscope, conditions in the fetus insufficiently studied before. The great irregularity of the fetal heart during the perineal stage is astonishing. The beats run from 80 during, to 180 per minute, between the contractions in many cases, and yet the infant may be born showing no signs of distress. But this is exceptional. It is wiser to regard such extreme fluctuations as indicating danger to the life or the future health of the child and to extricate it from its perilous position by means of episiotomy, or forceps, or both. A persistent slowing, or hastening, of the fetal heart, especially between pains, is always significant of danger.

This head stethoscope has other advantages:

1. It is aseptic; the operator does not have to touch it. If needful it may be boiled.

2. It combines the advantages of air sound conduction and bone conduction in one instrument.

3. By pressing the bell in deeply one reduces the thickness of the tissues and comes close to the fetal heart. The last two factors render the tones audible even in the presence of outside noises and stertorous respiration of the mother. To one who is hard of hearing, also, this is a valuable help.

4. The instrument renders the ausculation of the fetal heart very simple, very quick, very easy; and, therefore, one will listen ten times

more often than he would if, each time, some one had to adjust the ordinary stethoscope to his ears, or if the assistant had to be asked to listen. Further, the danger of the assistant, or the nurse, touching the sterile field is obviated, and the accoucheur gets personal, and positive, information of the condition of the child all the time.

5. The use of such a special instrument emphasises the importance of watching and safeguarding the child's life at this critical stage.

6. By the more intensive study of the fetal heart during the second stage, made possible by this instrument, we will surely add to our knowledge of the accidents of labour, and of the diseases of the child in the first days of its life.

I am absolutely certain that the generalised and consistent employment of this instrument will save more infant lives than both the measures about to be described in this paper.

2. *Occipito-Posterior Positions.*

If I were to single out one of the abnormalities of presentation and position that caused the highest fetal mortality, I would, without hesitation, select posterior position of the occiput in head presentation.

Text books generally, state that occiput-posterior postions, in the majority of cases, terminate spontaneously and happily for mother and child. This is true; but there is not a small minority of cases of occipito-posterior positions that persist and require the assistance of a high degree of obstetric skill for their successful management. If this is not to be had, but ill-timed and poorly executed interference is made, we have one explanation of the high infantile mortality in birth, for the large number of mental cripples, and for injuries of the maternal soft parts, with or without infection, and the inevitable permanent invalidism therefrom. Though I cannot prove the statement with figures, I feel sure that more children die as the result of improperly managed occiput-posterior positions than are saved by cæsarean section, performed, as it is to-day, on the most flimsy indication.

Two classes of cases present themselves; those where the head does not engage, and those where engagement has occurred, but the occiput does not rotate to the front, even during a prolonged, watchful expectancy. For purposes of treatment, these two degrees of engagement, or station of the fetal heart, are of extreme importance. In both instances one should have great patience. The bag of waters is to be preserved until dilatation is complete. A thorough examination should be made to determine the cause of the posterior position and of the delay. Perhaps this cause would have given an indication for the classic cæsarean section, if it had been discovered in time, as it

may now, for one of the newer methods of section soon to be described.

If it becomes necessary to render help before the head is engaged, in multiparæ, version is the operation of choice; in primiparæ, version is not a good operation. I usually twist the child in the uterus, passing the hand well above the promontory, operating mainly on the trunk, bringing the back well to the front (Pomeroy of Brooklyn brings the back into the opposite oblique); then I draw the head into the pelvis with forceps, and leave the case to nature—or to follow a subsequent indication. It often happens that, finally, I have to deliver the patient by art; but the delay has secured a great gain—the head has become moulded to the pelvis in its new position, the cervix and pelvic connective tissues have been drawn up out of the way, the pelvic floor has been prepared for the delivery, by being softened and partly dilated, and thus a formidable "high forceps operation" is replaced by a relatively simple low, or at most, midplane delivery. While the two-stage operation is very distressing to the patient, involving usually two anæsthetics, and is wasteful of the surgeon's time, the advantages are very considerable.

In those cases where the head is engaged, one may seek to turn the occiput to the front by combined manipulation, working on the head within and without at the same time. Formerly I recommended pushing the head up out of the pelvis and performing the manœuvre above described on the floating head, but in one case, while doing this the cord prolapsed, and I had great trouble in saving the child. In either case, but especially after the head has engaged, the difficulty has usually been, not to turn the occiput to the pubis, but to hold it there until I could get the forceps securely applied to the sides of the fetal head. The assistant, operating from without, seldom succeeded in holding the head in position for the few seconds required.

It, therefore, occurred to me to retain the head in position by means of a volsellum forceps, affixed to the scalp, and I was surprised to see how easily it was done, and how successfully this simple manœuvre held the head in its new position. Then I found, in a few cases, that by using gentle traction on the head and following carefully the mechanism of labour, I could actually turn the head from a posterior quadrant to its proper position by means of a volsellum forceps. An ordinary eight-inch artery clamp does just as well, and does not leave the tiny punctures in the scalp, although I have had no trouble from these minute injuries.

For the purpose, therefore, of reducing infant mortality in occiput-posterior positions, I recommend the two-stage operation, first, correction of the abnormal position, and, second, only if need be,

artificial delivery, and the use of the volsellum, or other clamp, to aid in the rotation of the head, and the application of forceps.

In the treatment of face and brow presentations, in a general way what was said of occiput-posterior positions applies also. Where it seems inadvisable to do version, manual correction of the face or brow, changing it to an occipital presentation, is the standard treatment. Occasionally, all methods, even the improved Thorn Schatz combination, fail to effect the extreme flexion needed. As before, the difficulty is not in getting the head into the desired attitude and position, but in holding it there long enough to get the forceps blades applied in the best manner for traction.

Here, again, the volsellum forceps will be of distinct service. The head may thus be firmly anchored and steadied by an assistant, while the obstetric forceps are adjusted.

In order to see if it would be possible to effect the change from a face to an occipital presentation by means of volsella alone, I tried it on a case of face presentation, a primipara, aged forty-one, with eclampsia. The patient had been in labour for two days, and several attempts to change the face to an occipital presentation had failed. The child was dead, and before doing craniotomy I tried this manœuvre. A volsellum was attached to the scalp just at the side of the large fontanel, and while slight traction was made of this, the face was pushed up by pressure on the glabella. Then another volsellum was attached to the top of the head, and while gently pulling on this and pushing on the first one, a higher portion of the head was reached; the first volsellum was then removed and attached over the occiput, and, by repeating the last manœuvre, the occiput was brought down. The method is similar to the bringing out of the uterus in the Watkins' interposition operation, and I was surprised to note how easily it was accomplished even in the tight vagina of an aged primiparæ. There was no injury to the scalp except the twelve minute punctures. I have not yet found it necessary to do this operation on a living baby in face presentation, but will not hesitate to do so if a case presents where other manipulations fail.

Naturally, such a delicate procedure must be done with art, not with strength; a statement which applies to all manipulations in obstetric surgery. The outside hand, of course, aids the internal manœuvre.

3. *The Newer Methods of Cæsarean Section*

In the olden times the deliberate sacrifice of the living child for the safety of the mother was not a rare operation, and, under the circumstances which frequently conspired (and even to-day still occa-

sionally exist), the accoucheur was to be felicitated, if he thus rescued one individual from a situation which imperilled both. Nevertheless, from the earliest history of our art, craniotomy on the living child has been the opprobrium of the obstetrician, and he has spared no effort to remove it. Now, thanks to the improvement of the teaching of the science and art of obstetrics, and to the invention of new methods of delivery, we are reducing the necessity for destroying the child to a dwindling minimum. But I would not have you believe that the number of children saved in the aggregate by these newer operations is at all proportionate to the prominence given them in the literature, indeed even in this paper. As was already stated, far greater numbers of fetal lives may be saved in the ordinary daily routine of practice, by studying the condition of the fetus with the stethoscope, by omitting meddlesome interference (pituitrin, attempts to unduly shorten labour, etc.), and by the application of well-established principles to obstetric operating.

The tendency of modern obstetrics has been to proceed too much on surgical lines, and this is especially true of cæsarean section. Too many cæsarean sections are being done by some men and not enough by others, which means that the indications for the several obstetric operations have not yet come into the working knowledge of the general practitioner. By means of the newer methods of abdominal delivery, we will strengthen the hands of the family physician, we will retrieve many of his mistakes (and perhaps our own, too).

Cæsarean section has been done on the dead mother since time immemorial. The operation is referred to by the early Egyptians, and in the myths and folk-lore of the European races. The Lex Regia of Numa Pompilius, 715 B.C., expressly commands the removal of the child before the burial of the mother. Cæsarean section on the living is of more recent date, although, in all probability, it was performed by earlier peoples. The ancient Jews applied the term "jotze dofan" to a child delivered through the belly of the mother. In 1879, Felkin, an African traveller, witnessed a cæsarean section performed by the natives in the heart of Uganda. The woman was held in a reclining posture by two men. At her side was a gourd of banana wine, and she was half drunk. The operator stood at her left. First he washed his hands in banana wine, then he washed the belly with the same, active antiseptic measures. With a short, curved knife, he made one incision, laying bare the pelvic organs, and the uterus was opened by hooking his fingers into it. By uterine massage the placenta was expressed and hæmorrhage controlled. Several bleeding points were cauterised with a hot iron.

The cervix was dilated from above with the fingers. The assistants then turned the patient on her side to allow the blood to drain out of the peritoneal cavity, the intestines being retained by a square of pleated twigs, after which the belly was sewed up with pins and figure-of-eight sutures. Pins were made from bamboo stick, the sutures from reed fibres. The wound was covered with a paste made of aromatic herbs. The patient recovered in eleven days, having run a mild febrile course. Without doubt, this operation must have been performed by these savages for many centuries in order for the technic to be so perfectly developed.

The first generally accepted cæsarean section was made by J. Grautman, of Wittenberg, in 1610, on a case of hernia uteri gravidi. Engleman says that about 1250 Bishop Paulus, of Madeira, Spain, performed one; also that Christ Bain did one in Italy in 1541. About 1500, J. Nufer, a swine-gelder in Switzerland, had successfully delivered his own wife after a dozen midwives and several barbers had failed, and in 1581, F. Rousset published fifteen cases, which probably were not all extra-uterine pregnancies, as has been suggested. Rousset's monograph established the operation, and in spite of its own frightful mortality and the resultant opposition by many of Europe's best accoucheurs, it very slowly became an acceptable recourse in those forlorn cases, where the parturient, almost to a certainty, would have died without it. The Catholic Church had much to do with the habilitation of the operation, since it enabled the rite of baptism to be given to the child. Sigault's symphisiotomy for a few years only was a competitor of cæsarean section.

Kayser (Copenhagen, 1844) found a mortality of 62% for the previous eighty years, but Tarnier said that up to his time there had not been a successful case in Paris during the nineteenth century, and Spaeth said the same thing of Vienna in 1877. Harris, in the 80's collected eighty cases in the United States, with a mortality of 52%. The causes of death were hæmorrhage and infection. In those days, sutures were not put in the uterine wound, because the ends could not be left long for their subsequent removal. As a result the woman often dies of hæmorrhage into the peritoneal cavity. For the same reason, lochia escaped into the belly and usually set up peritonitis. Further, aseptic technic was unknown, and all laparotomies were fearfully dangerous. In 1769, Lebas put three stitches in the uterine wound and left the ends long, by which they were subsequently removed, with success; but a true, efficient uterine suture was not made until Sänger recommended it in 1882. In 1877, Porro, of Pavia, to avoid the dangers of hæmorrhage, and of infection,

from the leaking of the lochia, advised the supravaginal amputation of the uterus after the child was delivered, and for a short time this operation bid fair to replace the old, conservative cæsarean section. Sanger's operation in 1882, showed such good results that Porro's was soon relegated to its proper place, as an operation where there is some special indication for sacrificing the uterus. The essentials of Sanger's operation are: median abdominal incision; median uterine incision, with or without eventration of the uterus; use of rubber ligature around the cervix to stop hæmorrhage; resection of a strip of uterine muscle under the peritoneum; eight or ten interrupted silverwire seromusclar sutures, avoiding the decidua; twenty to twenty-five interrupted fine silk seroserous (Lembert) sutures; extreme antisepsis.

Previous to Sanger, the abdominal incision had been made in all possible locations, the uterus opened in many different places and ways, drainage of the uterus, of the abdominal cavity, above and below, and many other devices had been practised, in order to prevent hæmorrhage, seepage of lochia, adhesions of the uterus to the abdominal wall, to the omentum, and to avoid the danger of rupture of the scar in subsequent pregnancies.

Since the difficulties above enumerated always beset the classic cæsarean section, and since the greatest dangers came from the fact that the peritoneum was opened, the old accoucheurs sought to avoid this necessity, and tried to extract the child from beneath the peritoneum. The first suggestion came from Joerg, in 1809, and Ritgen performed the operation in 1821. Physick, of Philalelphia, in 1824, recommended this method to Dewees of Philadelphia, but I could not find that Dewees had performed it. Joerg suggested that the incision be made in the flank, and that the peritoneum be dissected upwards in the manner preparatory to ligation of the internal iliac artery, the child being extracted from the parturient canal. In 1870, T. Gaillard Thomas revived the operation, which had been named "gastro-elytrotomy" by Baudelocque. Very few of these operations were successful, as we can readily understand. It was because of the lack of asepsis, and infection killed nearly all of the women.

When Sanger's classic operation became established, the mortality of cæsarean section dropped; and, in the 90's, series of cases of 100 with three or four deaths were reported, which for the time, and considering the high mortality of previous years, was very satisfactory. With more widespread usage of the operation, however, its inherent dangerous features became more appreciated; and, on the other hand, its limitations were keenly felt. In order to be successful, the

classic cæsarean section must not be performed on any but clean and unsuspicious cases. The classic cæsarean section also left adhesions in the belly, the uterus adherent to the abdominal incision, the omentum to the uterus, intestinal adhesions, even in aseptic cases. Acute gastric dilation and partial paralytic ileus are still too common, and the mortality from peritonitis is still too high. These accidents are probably due to seepage of the lochia, since the uterine wound is not at rest (after-pains), and the healing is precarious.

Furthermore, the accoucheur felt he must have better means to rescue the mother without sacrificing the child, in neglected labours. Obstetrics must keep pace with the increasing valuation of child life. The classic cæsarean must be still further improved. Therefore, we hear of new incisions; high (Davis), low (writer), transverse fundal (Fritsch), of extraction of the fetus in the sac, with subsequent opening by an assistant. Many varieties of suture have been recommended, through-and-through, interrupted or continuous, buried muscular, seromuscular, decidual, three layers, four, five layers, silkworm gut, wire, silk, catgut, linen, etc., but the first real progress was made in 1906, when Frank of Bonn disinterred the old extra-peritoneal methods. He opened the abdomen just above the pubis, united the peritoneum of the uterus to the peritoneum of the abdominal wall, thus shutting off the general peritoneal cavity, and delivered the child through the almond shaped opening thus provided. Later, Sellheim attempted to push the peritoneum upward from off the bladder, as was recommended by Physick in 1824, which thus freed the space over the cervix and lower uterine segment, through which he delivered the child. Many operators, mostly Continental, developed these ideas, and now there are about twenty different procedures. All these methods of performing the operation depend upon certain changes which occur, during pregnancy and labour, in the relations of the cervix and lower uterine segment to the bladder and vesical peritoneum.

We know that during pregnancy the peritoneum over the lower uterine segment and bladder becomes very much softened and loosened from its base. It also hypertrophies under the stimulation of pregnancy. With the development of the lower uterine segment and cervix in the latter weeks of gestation, and particularly in labour, the muscle of the cervix is drawn away, upwards and outwards, from the bladder attachments. The vesico-uterine cul-de-sac is usually obliterated. The peritoneum is also drawn upward at the sides of the bladder in the neighbourhood of the round ligaments. At the same time the mobility of the peritoneum on subjacent struc-

tures becomes much increased. It is therefore possible, after incising this portion of the peritoneum, to push the bladder off of its cervical attachments with great ease, and expose an area of the cervix and lower uterine segment large enough for the delivery of the child without encroaching on that portion of the peritoneum which is opened in the classic cæsarean section. Of the twenty or more operations that have been invented, only two seem likely to obtain recognition.

All these methods may be divided into two classes. First, the transperitoneal, and second, the extraperitoneal. In the transperitoneal operation, the belly is opened above the pubis and the peritoneum over the cervix near the bladder is incised and loosened from its bed. By means of closely-set continuous sutures, or by clamps, the pariteal and cisceral peritoneal layers are united. The lower uterine segment and cervix are then incised, the child delivered, the placenta following; then the uterus is closed and the double layer of the peritoneum also reunited. The general peritoneal cavity thus is temporarily removed from the field of operation, and infectious matters, such as meconium, liquor amnii, blood, etc., are not permitted to spread over it. Some operators cut the line of sutures and reunite the individual layers of peritoneum. Others do not do this, but sew the two layers together. Sellheim sews the uterine wall to the skin and leaves the wound open to drain, and calls such a delivery one through a utero-abdominal fistula. Among transperitoneal cæsarean sections, that invented by Kronig and modified by Gellhorn of St. Louis, seems to possess most advantages.

Of the extraperitoneal methods, that of Latzko is the best. In Latzko's operation the incision is made either transversely or longitudinally, just above the pubis. The peritoneum is pulled out of the pelvis, the bladder is pushed off of the cervix to the right, and beneath the vesico-uterine fold, which has been pushed up toward the navel, a bare space of cervix and lower uterine segment is provided through which the child is delivered.

The Indications

From the above descriptions it is evident that two new operations have been added to our *armamentarium*. Both have this in common, the lower or cervical zone of the uterus is opened for the delivery of the child, whereas in the old, the classic operation, the corpus or fundus uteri is opened. We must hereafter speak, therefore, of cervical cæsarean section and corporeal, or classic, cæsarean section. Since there are two methods of cervical section, and each has its own

indications and conditions, we have three distinct operations to consider when the question of abdominal delivery arises. It is not alone, "Shall we perform cæsaren section in this case?" but "Given the indication for abdominal delivery, what kind of section shall we perform?"

The old teachers divided the indications for cæsarean section into absolute and relative. The absolute indication existed when there was no possibility of delivering the child through the natural passages, the way being blocked by a contracted pelvis, a neoplasm, scar tissue, etc., or the child being a mammoth. The relative indication existed when, after carefully balancing all conditions, the accoucheur decided that the abdominal delivery offered the best chances for mother and child. It is, therefore, almost wholly subjective, and it left a wide field for the play of individual preference, for the influence of isolated experience, and for the clash of contending statistics. Moderately contracted pelvis, placenta previa, eclampsia, are the main so-called relative indications. Before taking up the specific indications, let us study the comparative merits of the two contenders for favour, the corporeal and the cervical cæsarean sections.

Even the most devoted adherents to the classic operation will admit that it has serious disadvantages. Amand Routh showed 2% to 10% of deaths for Great Britain, and, although many operators can report series of a hundred cases without mortality, many women still die from the operation, as witness the report of Harrar from the New York Lying-in Hospital for 1917. Peritonitis is most to be feared, but ileus, gastric dilation, the dangers of adhesions, and of rupture of the uterine scar in subsequent pregnancies, are also very disturbing factors. Some of these dangers can be avoided by limiting the operation to absolutely clean and favourable cases, and it is thus that the series of hundreds without fatality are obtained. But adhesions and rupture of the uterine scar cannot always be avoided, and, furthermore, the necessity of restricting the abdominal delivery to a small class of cases is just that which has stimulated the accoucheur to improve the methods.

That the newer, cervical operations, will enable us to expand the indications to cover those cases where the classic cæsarean is too dangerous, of this I have no doubt. My own experience is not large, comprising only twenty cases, of which fifteen I treated myself, the others being operated by my associates. In four of my cases the conditions were not good for the corporeal section. Two of these labours would have eventuated in craniotomy and two in pubiotomy

had they not been treated by the new cæsarean. Two of the mothers made stormy recoveries (one suppuration in the cavity of the retzius, one thrombophlebitis), but all the mothers and babies left the hospital well. The convalescence of these patients is much smoother than that after the classic operation, a fact which is noticed by my associates, the internes and the nurses, who perform the after care. Peritoneal shock, ileus, gastric dilation have not yet been observed, tympany and post-operative pain are decidedly less, and one gets the impression that the woman has suffered only a minor operation, not the ordeal of the old cæsarean section. Stitch abscess is a little more frequent, which is because we are not so careful in selecting the cases, but it is at the same time less dangerous.

Regarding peritoneal adhesions I cannot speak, not yet having operated one of the patients for the second time, but Continental accoucheurs report them absent, and, theoretically, they should be. In most of my operations the intestine was not touched, and in many of them it did not come into view at all. Further, the contents of the uterus, which many times are irritating if not actually infectious, do not soil the general peritoneal cavity, and finally the line of uterine suture of the finished operation is about two and a half inches long, and when the bladder fills, is covered by this viscus. In the true extraperitoneal method (Latzko), the peritoneal cavity is not opened at all, and in the absence of infection, adhesions, ileus, etc., will not occur. Should infection follow, or should lochial seepage occur, the abscess will be extraperitoneal and most easily accessible for drainage from below.

Regarding rupture of the uterine scar in subsequent labours I cannot say, having no personal experience. One of my patients went into labour prematurely in her second pregnancy, and was delivered of a live infant by the corporeal section by another surgeon. I am to deliver her third child in September. Evidently the new operation does not interfere with fecundity. Continental writers claim that the danger of rupture of the cervical scar is almost *nil*, there being only two cases on record and in these, part of the incision had been made in the body of the uterus. Experience with vaginal cæsarean section, where the incision is made in the same part of the uterus, shows us that rupture in subsequent labour is not to be feared; and, theoretically, this is easily understood. The wound in the body of the uterus is not at rest during the healing process. The contractions disturb the apposition of the cut surfaces, and even in the absence of infection, they are prone not to unite. The wound in the cervix, on the contrary, is at rest.

As far as primary mortality is concerned, the figures present a still stronger argument. From Continental sources I collected 430 cases with seven deaths, a little less than 2%, and this includes clean, suspects and frankly infected patients; also, it covers both forms of cervical section, the extra and the transperitoneal. In America, Hirst (50), Gellhorn (4), Polak (22), Williams (5), Moore (6), and myself have had 107 cases, with one maternal death and two fetal deaths, one of which was macerated.

In general I must say, that the more I do these newer operations the better I like them; and, now, they are the first thought when the question of cæsarean section arises. For doing the old, the classic cæsarean, I have to have special indications, and these are usually, the necessity for haste, the desire to remove fibroids, placenta previa, where a Porro operation is to follow, in excessively fat women, and extremely pendulous abdomen.

The choice between extraperitoneal and trans, or perperitoneal, methods is still undecided, but the majority of operators prefer the latter. The true extraperitoneal operation has the distinct advantage that it protects best against peritonitis, infection, if it occurs, being less dangerous in the connective tissue, and drainage being so easily procured. Its disadvantages are that it is often hard to separate the peritoneum and bladder from the uterus, the peritoneum often, and the bladder occasionally, tearing through. The uterine incision sometimes extends down into the base of the broad ligament where lie the large veins and ureter; also, the delivery of the child is technically more difficult, and its mortality slightly higher. For these reasons, and, further, since the results for the mother are almost as good, the transperitoneal operation is most often selected.

Let us now consider the most common indications for abdominal delivery but briefly. In the presence of insuperable mechanical disproportion, *i.e.* the absolute indication for cæsarean section, the older obstetricians could only do, if discovered in time, a therapeutic abortion, or the classic cæsarean section at term. If the dystocia was experienced only after infection was present or suspected, a Porro or complete uterine extirpation was demanded if the life of the woman was not to be forfeited.

Nowadays we may proceed differently. Therapeutic abortion is absolutely contra indicated. At full term we have four courses to select from. The classic cæsarean, the same with Porro, the transperitoneal cervical section, the extraperitoneal section. In clean and suspect cases I recommend the transperitoneal cervical section, and in

frankly infected cases the extraperitoneal section or the Porro cæsarean.

Of the indications comprised in the term "relative" nearly every obstetric complication we know has been advanced as a good reason for abdominal delivery.

In the treatment of labour in pelves that are not absolutely contracted my plan has become much simplified in recent years. Unless the patient positively demands the induction of premature labour I do not do it, but I allow the pregnancy to go to term. Just before labour begins I make a careful rectal and abdominal examination to determine if there is any chance that the fetus will pass through the pelvis. If I decide it is highly improable, I do the transperitoneal cæsarean as soon as labour is well under way. If there is reason to believe that the head will go through, I give the patient a real test of labour. If delivery proves impossible, in primiparæ I do the transperitoneal section, in multiparæ either this or pubiotomy, being guided by the individual conditions present. This statement holds also for cases where infection is suspected. In frankly infected cases I still fear to perform an abdominal delivery in spite of the wonderful results reported by Continental operators. If such is necessary I would recommend the extraperitoneal method with free drainage in young women, uterine extirpation in old. Williams recommends the Porro to meet this emergency. It is just in these neglected cases that the extraperitoneal method is the easiest of performance. The prolonged action of the pains has drawn the lower uterine segment out, pulling the utero-vesical fold of peritoneum high up away from the bladder, thus giving a large area for incision and extraction of the child. However, in frankly infected cases craniotomy is still to be held in reserve, since the child is almost always doomed anyway. That the operation will completely eliminate the necessity for craniotomy, Kustner is the only authority to contend.

Eclampsia

I will not discuss the question as to whether or not cæsarean section has a place in the treatment of eclampsia. I am not yet ready to go back to the expectant and medicinal treatment of my student days, nor do I treat every case by instant delivery. If one desires a rapid, easy method of emptying the uterus, and one unattended by shock, the transperitoneal cæsarean may be selected. It may be done under local anæsthesia, just the delivery of the child being assisted by a little gas oxygen anæsthesia.

TREATMENT OF PELVIC INFLAMMATION

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By pelvic inflammation nature attempts, and in most cases attempts successfully, to stop the invasion of septic micro-organisms which usually have gained entrance by way of the utero-vaginal canal.

Our first and paramount duty is to make sure that we do not assist the entrance, or advance, of bacteria by unnecessary or improperly conducted examinations, local treatments or operations—either obstetrical or gynæcological—because once the invaders have penetrated the endometrium, experience has proved that it is folly to try and dislodge them during the acute stage. The net result of over-zealous treatment at this time is usually a destruction of the natural forces of protection and a spread of the infection, to say nothing of the sacrifice of organs which might have been saved with more conservative treatment; for example, the exciting cause of salpingitis, cellulitis, oöphoritis, septicæmia, etc., may be douches, local applications or curettage used in the treatment of acute endometritis. Or again, an acute salpingitis which probably nature has under control, may be converted into diffuse peritonitis as the result of an ill-advised laparotomy.

In view of such disastrous results, the proper treatment is to avoid radical operations in acute pelvic inflammation, although surgical interference may be required as under the following conditions:

(*a*) Where there is a reasonable chance that the diagnosis is not correct, and that there is present some other condition which may require immediate operative interference, as appendicitis, ectopic pregnancy, or suppurating tumour;

(*b*) Spreading, diffuse peritonitis;

(*c*) Collections of pus that can be drained extra-peritoneally, *e.g.* by posterior colpotomy;

(*d*) Radical operation may occasionally offer the best means of saving the patient, for example, laparotomy for a definite indication of the presence of pus that cannot be otherwise evacuated, and the patient is growing progressively worse;

(*e*) Ligature of the pelvic veins in septic thrombophlebitis may sometimes seem advisable.

If no such indications are present, better results are obtained by non-operative treatment, but a close supervision of the general management is always required and it is often a surprise how quickly a patient improves as a result of careful nursing merely, including com-

plete physical and mental rest, hot or cold applications to the abdomen for the relief of pain, a liberal supply of semi-solid food, of fresh air and drinking water. Drugs may be used to relieve symptoms, such as pain, sleeplessness, constipation or diarrhœa. Quinine may be given in tonic doses; pyrexia is best controlled by sponging; stimulants are used where necessary. Fowler's position promotes drainage, while salines, injected per rectum, subcutaneously or intravenously, relieves thirst and probably assists in the elimination of toxins. Five per cent. glucose solution, per rectum, has considerable nutritive value. Blood transfusion may be required. Vaccines are strongly advocated by some, while serum is said to be dangerous if there are undrained foci of suppuration.

The palliative treatment just outlined refers more especially to those resulting from puerperal or other wound infections, which are usually due to the streptococcus, because they are the cases that usually require very careful attention.

There is not the same anxiety, as a rule, in the care of a gonorrhœal case, as the toxæmia is milder; for example, a patient with gonorrhœal endometritis and salpingitis alone is often able to be up and about, then again diffuse peritonitis of gonorrhœal origin is rare. In the course of three or four months a gonococcus pus-tube often (though not always) becomes sterile, and its removal, if then necessary, can be accomplished with less danger than can a mass due to the streptococcus, which may remain virulent for years, and result in peritonitis if pus be spilled during its removal.

But, fortunately, many cases due to the streptococci leave no mass or other obvious lesion, and the patient may gain her general health as well as the functional restoration of the reproductive organs—which is a marked contrast to the permanent damage so universally inflicted on the adnexa by the gonococcus.

In chronic infections, treatment is quite a different matter, palliative measures will undoubtedly give temporary relief, but are usually disappointing. However, in the absence of urgent symptoms or signs of pus that can be satisfactorily drained, no harm can result in a trial of such measures as sufficient rest—particularly at the menstrual periods —nourishing food, care of the bowels, required medicines, such as syrup ferri iodide for the anæmia so commonly present, etc.

Local treatments commonly used are counter-irritants to the abdominal wall, hot vaginal douches and medicated tampons such as ichthyol and glycerin.

If no mass is present, a persistent trial should be given before operation is decided upon, but in cases of pyor hydrosalpinx, these palliative measures appear quite useless.

BLOOD PRESSURE IN PREGNANCY AND THE PUERPERIUM

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It is only a few years ago, since 1905, that the importance of blood pressure as an aid to diagnosis and treatment was brought to the attention of the medical profession generally by the invention of simpler and more accurate methods of estimation. Still later did the work of J. C. Hirst, Irving, Cook and Briggs and others, emphasise the value of blood pressure records of the pregnant woman.

The routine analysis of the urine in pregnancy was considered by some physicians quite unnecessary long after its vital importance was demonstrated, and now it is to be feared there are a few who look upon blood pressure records as an ultra-refinement of medicine more to impress the patient than having much practical import.

There can be no doubt that this is a mistaken view, and that blood pressure estimations in pregnancy rank at least equally with urinalysis.

Normal Blood Pressure During Pregnancy.

It would appear necessary in order to recognise a pathological blood pressure in pregnancy that we should have in our minds the ***normal*** limits both maximal and minimal. Is the normal blood pressure of a pregnant woman the same as of the non-pregnant of a like age? J. C. Hirst found that in one hundred non-pregnant women of the child-bearing age the systolic pressure was 112 m.m. This being correct (and other observers agree) we must conclude, from the records to be referred to, that average normal blood pressure of the pregnant woman is some degrees higher.

Taking one hundred consecutive uncomplicated pregnancies in the public wards of the Burnside Department of the Toronto General Hospital, the average systolic pressure was 121 m.m.; diastolic 79 m.m. and pube pressure 42. The highest systolic of the series was 147 m.m. (one case), and the lowest 84 (one case). Only twelve had a systolic over 130, only two under 100, so that 86% were not higher than 130 m.m. or lower than 100 m.m. Irving, of Boston, in a most valuable review of five thousand cases, found 80% were within these limits mentioned. Hirst writes that up to seven months there is an average increase of six m.m. in the systolic pressure and a further gradual

increase of six m.m. more from the seventh to the ninth month. This would make the systolic pressure 124 m.m. at term. Private practice must furnish the records for the earlier months as clinic patients seldom report before the sixth month.

Systolic blood pressure then in normal pregnancy should ordinarily range between 100 m.m. and 130 m.m. This does not mean that exceptional cases will not be even as high as 140 m.m. or 150 m.m. without any apparent pathological associated condition; for in our series the one with the systolic blood pressure 147 m.m., and two others over 140 m.m., had no discoverable cause for the hypertension and suffered no evil results. Nevertheless, it is wise to watch more carefully and examine more frequently any case above, what we might consider the limit of safety, namely, 130 m.m.

Blood Pressure During Labour.

In taking the blood pressure readings during labour we used a Tycos instrument for convenience on account of the patient's unwillingness to remain in one position. The blood pressure had been taken before labour began. In the first stage we took two or three readings, both during contractions and between contractions; also in many cases just after the membranes had ruptured. During the second stage readings were taken frequently. Further, the blood pressure was recorded directly after the birth of the child, twenty-four hours later, and two weeks later, before discharge.

Contractions of the uterus cause a rise in blood pressure varying with the strength of the contraction from four m.m. to fifty-four m.m. This rise is caused by probably more than one factor, as emptying of the blood sinuses of the uterus, increased abdominal tension making pressure on the splanchnic vessels; generally increased muscular tonus causing pressure on the blood vessels directly beneath them, and, perhaps, as Janeway suggests, reflex vaso-constriction.

Not only does a rise of pressure occur during each labour "pain," but as labour progresses there is a gradual elevation of level of both diastolic and systolic pressures between pains on the average amounting to ten m.m. Should exhaustion supervene or threaten there would probably be a fall of blood pressure, though I have had no opportunity of observing this.

When the membranes rupture a marked temporary drop in blood pressure immediately takes place, as much as twenty-eight m.m. in one of our series. Soon the pressure climbs again to its high level as before, and takes another dip directly after the birth of the child, as much as thirty-two m.m. in one of our series, ninety m.m. in one of

Heynemann's records. This second fall is not of a lasting nature; within an hour it is back to a few degrees below the ante partum position. Gradually in the puerperium it creeps up to or almost to its ante partum level at about the time of the patient's discharge on the fourteenth day. Janeway says that "both loss of blood and unusual exhaustion produce hypotension." In cases of post partum hæmorrhage, or placenta previa, with loss of a large amount of blood, a particularly prolonged lobus, we might respect the blood pressure in the puerperium and, even sometimes afterwards, to be subnormal for that particular patient.

There is a sharp "reflex" rise in blood pressure during instrumental delivery, version, and other methods of forced delivery, according to Cook and Briggs; which fact will explain the occasional rupture of a cerebral vessel which has occurred under these circumstances, and might well be borne in mind during attempts at too rapid delivery in eclampsia where the blood pressure is already so high.

The Effect of Pituitrin on Blood Pressure Administered During Labour.

It has been stated in a general way that pituitrin given during labour caused a marked and even dangerous rise in blood pressure of from twenty-five m.m. to forty m.m., and should not be administered during labour when the pressure is already above the limits, or when there is cardiorenal involvement. Our experience with twenty cases at the Burnside is probably too limited upon which to base a final conclusion, nor do we intend it as such, but more in the nature of a preliminary report. In these twenty cases pituitrin acted in the usual manner by increasing the strength of the contractions, and at the same time raising the blood pressure, as we found that increased contractions always did during a pain. Therefore, in order to estimate the amount of increase which was due to the pituitrin alone, we took our readings between pains, and compared these twenty cases with the twenty in which pituitrin had not been administered. The average systolic pressure was increased, from five to ten minutes after the hypodermic injection of one-half c.c. pituitrin, six m.m. The highest was twenty-two m.m. (one case), and the lowest no effect whatever (one case). In comparing the pressure line between contractions of these twenty cases with the other series of twenty which did not have pituitrin, we found that the pituitrin cases had an average pressure six m.m. higher during the second stage during which time the pituitrin was given. Pituitrin has besides been used in cases of toxæmia, even with a systolic pressure of 200 m.m., without any but good results as far as

we have been able to observe. We believe the raising of blood pressure a few points is fully compensated for by the shortening of labour in those cases where pituitrin is otherwise indicated.

Blood Pressure in the Toxæmias of Pregnancy.

Reviewing the toxæmias of pregnancy occurring at the Burnside from 1915 to the end of March, 1918, one cannot but be convinced of the great value of blood pressure estimations in obstetrical work. There were 106 of these cases during this three and a quarter years, divided as follows: sixty-eight toxæmias without eclamptic convulsions: thirty-four eclampsias and four definitely recognised as chronic nephritis. It is interesting to note that only three of these thirty-four eclamptics were clinic patients, and not one of these then had reported for some weeks.

The Burnside Hospital hold bi-weekly clinics for pregnant women. These patients are instructed to report every two weeks during the earlier months, and once each week from the seventh month to date of confinement. A careful examination is made, pelvic measurements recorded, blood pressure and urinalysis made, and should the patient show any signs of toxæmia she is urged to enter the hospital for treatment and close observation. The records of this department in regard to eclampsia show it to be a preventable disease in a large portion of cases, and are a tribute to the thoroughness with which the system has been carried out, and to the social service which is an indispensable aid in this work.

The highest systolic pressure in the series was 240 m.m.—a pregnant woman who has had chronic nephritis for some years, and who did not develop convulsions as might have been expected: the lowest, 125 m.m.—one of the rare cases of eclampsia. It is a question whether this case was one of real eclampsia or convulsions due to other causes. The great proportion of cases, 84% had a blood pressure over 160 m.m.—one at 125 m.m.; one at 136 m.m.; two at 145 m.m.; one at 147 m.m.; and one at 150 m.m. The average systolic pressure of the eclamptic cases was 164 m.m., while that of the toxæmia cases without eclampsia was 173 m.m., showing conclusively that high blood pressure alone cannot be taken as an index of the imminence of convulsions.

That fulminating form of eclampsia of the hepatic type with little if any kidney involvement gives the greatest difficulty even to the most careful obstetrician. But while usually the blood pressure in these cases is lower than in the classical type, with high pressure there is always some rise of from 10 m.m. to 20 m.m., which could be detected

if routine tests were made from the beginning of pregnancy, and such increased blood pressure should always warn us to make a most careful investigation with the condition of the patient and thorough urinary examination as regards total quantity, specific gravity, urea, content and presence of albumen. In this way we might often detect conditions which would be amenable to treatment and so save our patients from ultimate disaster.

The early toxæmia of pregnancy causing pernicious vomiting and acidosis, and, finally, liver and kidney changes, is not attended by a change of blood pressure, suggesting that the form of toxine is different from that usually found in the later months and causing eclampsia.

FOOTNOTE.—The observations embodied in this paper were made in the Burnside Department of the Toronto General Hospital. I am indebted to Dr. B. P. Watson, chief of the service, and Dr. McIlwraith, for the facilities for carrying on the work.

THE MANAGEMENT OF A NORMAL LABOUR CASE

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In taking up the subject of the management of a normal labour, let us begin at the time when the patient places herself in the hands of her physician, which should be as soon as she finds herself pregnant, and she should remain under his observation until six or eight weeks following her delivery. You may say that such an arrangement is impossible and not at all practical, but until such conditions exist we can not obtain the best results.

It is also necessary to observe and direct during pregnancy the general surroundings of the home as to sanitation, food, drinking water, sleeping apartments and living rooms. Regarding matters of dress, clothing should be warm and light in winter, and suitable to the changes of spring and fall; and should hang from the shoulders and not from the waist. Too tight lacing in the ordinary corset is injurious. A properly fitting maternity corset or abdominal band is allowable even up to the time of delivery, and may be worn after the patient gets up from her lying-in period. The care of the skin is important, and elimination must be encouraged by proper bathing. The kidneys must functionate, and water should be drunk freely. The urine should be examined weekly and oftener if found necessary, and blood pressure readings must be taken frequntly and carefully noted. The bowels must be kept open, and especially is this important in order to avoid the hæmorrhoids so often seen at full term, which in many cases are due to and aggravated by an impacted rectum. The diet of a patient who is furnishing nourishment for two, or who has a beginning kidney or heart lesion, which will be aggravated by pregnancy, is of the utmost importance. Proper amount of rest and relaxation and freedom from care and worry must be provided for, and this is not a simple matter to a woman who has a household to manage, and has the bringing up of other children as well as many other worries. A pregnant woman should be cautioned to observe little things during her pregnancy, which of themselves seem trifling, but which really are the forerunners of much danger. She should be told of possible gastric pains, with or without vomiting, headache, dimness of vision, dizziness, swelling of the hands and feet, as well as a scanity urine.

It is well to instruct her regarding the movements of the child, and especially as to whether movement stops abruptly during the pregnancy, which may mean the sudden death of the fœtus. The

patient should select for herself the very best room in the house for her delivery, and all unnecessary furniture should be removed; the bed should be of the single type, with good springs and a hair mattress—the mattress should be protected by a rubber sheet. If it were possible for me to attend to all my women at their homes, I would not take any of them to a hospital for her delivery, unless the case was an operative one, or that the family was so large and the quarters so small, that she could not be cared for at home, for the reason that I believe the majority of the infections we see are contact infections and are carried by nurses from one patient to another. You very rarely see impetigo contagiosa in the new born when cared for at home, but it is very common indeed in our hospitals. Ophthalmia neonatorum is more prevalent in institutional cases, in spite of our efforts with silver nitrate to avoid it. The same applies to vaginitis of the newborn. This may seem a strange comment coming at this time, when hospital care is being used so frequently, but it is my honest opinion, based upon over 7,000 personally conducted confinements covering a period of twenty-seven years of active work.

Before the ninth month of pregnancy the pelvic measurements should be taken and recorded, and some definite idea should be made as to the management of the case.

What do we mean by a "normal labour?" We might answer, "One completed in twenty-four hours without injury to mother or child." In a primipara that time is presumably about right, in a multipara, it might be too long. We divide labour into three stages—

1. The stage of dilitation;
2. The stage of expulsion of the fœtus; and
3. The placental stage.

How should the woman conduct herself through the first stage? When called to see a woman in the first stage of labour, the cervix admitting one finger, it is good practice, providing no complications exist in her pelvis, to try and make out that she is not in labour, that her discomfort is due probably to some intestinal complication and that real labour has not begun, thereby taking her mind off from the subject as much as possible and avoiding the strain of expectancy which accompanies the first stage. Later, when the second stage begins and a flow of blood appears with possibly some fluid escaping, she can be told the exact stage she is in.

The second state of labour is the time when the woman suffers her hardest pain and is subjected to the greatest nerve strain; it is in this stage we have the foundations laid for rectoceles and cystoceles. During the second stage the bladder should be empty. I catheterise

at this time every patient, believing firmly that no woman should be delivered with the bladder full of urine. When the cervix is fully dilated the membranes have fulfilled their purpose and can be ruptured, but not during a pain as the sudden escape of fluid is liable to bring down a loop of the cord; they should always be ruptured between pains, either by the gloved finger or some sharp sterile instrument, care being taken not to injure the presenting part. Much can be learned at this time by observing the amniotic fluid, whether it is clear or cloudy or contains meconium; if clear one can feel that there has not been much pressure upon the child and its vitality is probably good, but if the amniotic fluid is foul and contains meconium, the prognosis as to the viability of the child better be guarded. This of course applies also to cases of hydramnios where the child is apt to be defective.

The presenting part of the child is the part first touched by the examining finger; the character of the labour will be determined largely by the manner in which this presenting part engages in the pelvis: if our finger touches the head we say the head presents, but where the occiput will be, will depend entirely as to how the head engages, and so with a breech. As this paper is intended to deal with only a normal case, I shall not take up the faulty presentations. The vulva in all cases is shaved and cleansed with warm soap and water. No douche is given on account of the productive bacteria in the vagina. The operator should at all times wear sterile rubber gloves, preferably those that reach to the elbow, so that in case he has to introduce the whole hand into the uterine cavity his arm will be protected. I have given up entirely the use of so-called antiseptics, depending upon boiling for sterilising gloves, instruments, catheter and cord ties, needles, etc., at the time they are used. Now a word as to anæsthesia. I believe every woman should have some anæsthetic during labour, whether it be ether, nitrous oxide with oxygen, or chloroform, will depend upon the preferences of her medical attendant. In some localities ether is the choice; nitrous oxide has its advocates; personally, I use chloroform, and have never had any cause to regret it. I think that during the expulsion of the head the patient should be in surgical anæsthesia, and the term "obstetrical anæsthesia" should not be recognised. The condition of the child must be carefully watched during this stage by frequently listening to the fetal heart, as it will govern largely the conduct of the labour from now on. The mother's general condition must be looked after. The labour has now progressed to the point where the head is to be delivered. We have carefully watched the rotation of the occiput until we are sure

it is anterior either to the right or to the left, being positive by having touched the ear, and not depending upon sutures and fontanels, which are often misleading. Too many vaginal examinations are unnecessary and are dangerous; if frequent examinations are required and the proper methods of sterilisation are not at hand, they can be made through the rectum, although I do not often employ this route. The external method can be used also. We now have the head on the perineum, and the manner of preserving the soft parts must occupy our attention. There are certain principles to be borne in mind—

1. Prevent too rapid expulsion.

2. Maintain extreme flexion until the occiput is outside the symphysis before allowing extension to take place.

In preventing too rapid expulsion we must—

1. Have the patient in proper position to hold back the presenting part if necessary, and this is obtained by having her on a table (an ordinary kitchen table makes the best delivery table), or crossways of the bed. A patient can not be delivered as well lengthways in bed.

2. Anæsthesia enables us better to control the patient as well as aids in relaxing the soft parts.

A little maneuver which has helped me many times is to grasp the head firmly with the hand, and turn it to one side or the other, thereby allowing the face to escape sideways and the smooth side of the head to slip over the thinned perineum. The *anterior* shoulder and arm are then delivered, followed by the *posterior* arm and the child's body is brought up over the symphysis, thereby relieving the tension on the perineum. The child is then placed upon the abdomen of the mother on its right side and allowed to remain a few minutes before tying the cord, providing it is still pulsating; otherwise it can be tied immediately. Do not spank the baby to make it breathe. A few breaths of air on the child's chest will usually start up respiration, because many children are shocked by the spanking and not stimulated to breathe. Care should be taken in tying the cord, to tie it in a manner that it will not slip and allow a fatal hæmorrhage, a thing that has happened to me once: for that reason I always tie the cord twice, placing the second tie upon the ends of the first tie so as to prevent slipping; or another method is to put a purse string suture of catgut around the base of the cord, including the skin of the abdomen, and cut the cord off flush with the abdomen and dress with a compress. This is probably the cleanest way if the child has to be left to the neighbourhood nurse. Silver nitrate solution, 1%, should be placed in the eyes of every new-born child. After cutting the cord at the child's abdomen it should be cut off flush with the vulva of the mother, and thus avoid carrying infectious material

from the region of the rectum where the cord usually rests, and time should be given for the separation of the placenta. Mistakes are often made and trouble invited by too great haste in delivering the placenta. Do not begin to crede the uterus nor make any pressure until you are sure the placenta is loose and in the vagina.

Formerly I douched every case. I do not so often now. It has its advantages, however, if properly done, in removing clots and holding the uterus firmly contracted. The patient is now ready to be placed in a dry bed; a binder can be put on or not as desired; if the abdomen is much relaxed it no doubt is a comfort; otherwise I see no benefit from its use.

No attention need be paid to the bladder for twenty-four hours; then catheterise if necessary, but not until other means have been tried to induce her to void. A cathartic, castor oil, during the second twenty-four hours before the breasts fill up, gives a feeling of relief.

I do not put the baby to the breast until there is milk, for this reason, that a baby chewing upon a nipple of a nervous woman with no milk may cause trouble, and perhaps it aids in producing sore nipples; in the meantime malted milk, one to twenty, can be used. I find this a great factor in preventing sore nipples, even though they have been treated during pregnancy. Patients should be encouraged to move about after six or eight hours, and after the second day I have them lay on their stomach for twenty minutes daily: it aids drainage and assists in getting a properly involuted uterus. Putting the bed in Fowler's position is of advantage many times, as it favours better drainage; after-pains are controlled by morphine when necessary.

Now the question arises when shall we let our patients up? Are we keeping them too long in bed, or are we letting them up too soon? There can be no hard and fast rule regarding this question. We must be sure we have a well involuted uterus and the uterus should be in proper position. Most patients will stop flowing in about ten or twelve days, and if, upon examination, the uterus is found to be in proper position, it is well to let them up. Too long a rest in bed is not desirable. In a certain number of women we find the uterus retroverted with no symptoms, but often a retroverted uterus is the cause of the continued bleeding.

Now let us consider a few of the unlooked for things that are liable to occur during a normal delivery.

First, conditions concerning the child, the cord may be tightly wound around the neck, or it may be unusually short; in either event the child is in danger, as some cords will stand compression much better than continued traction: or the cord may be prolapsed, as in the exposed variety outside the body, or in the concealed type, which is

more common than is supposed. A cord around the neck should always be recognised before delivery of the head, by examining carefully with the first finger introduced well up under the symphysis, and if the parts are very tight the cord should be clamped in two places and cut and the child delivered hurriedly, by forceps or by version. In a short cord labour is unusually prolonged, or there is often an unusual amount of blood lost from a premature separation of the placenta due to traction, and the fetal heart sounds become suddenly weak or stop altogether. Such indications demand immediate interference in the interests of the child. A prolapsed cord is best treated by version.

Some children have to be resuscitated even after a very normal labour. We have found it most satisfactory to introduce a catheter into the larynx of the child and carry air to the lungs by blowing in the catheter and expelling it by pressure on the chest. This method persistently carried out will give surprising results. The lung motor has not been found as effective.

Now a word as to lacerations of the cervix, vaginal wall and perineum. While I believe they are altogether too frequent, there are some cases where no doubt they are unavoidable; as for instance in cases where the head is of the hard unyielding type and the fontanels are closed or the soft parts of the mother seem to be unable to yield or stretch. The principle so long recognised in surgery of overcoming muscle contraction by anæsthesia must not be lost sight of; for deep anæsthesia and the proper position of the patient during the delivery of the head and shoulders will prevent many apparently unavoidable tears. Bad cervical tears should be repaired immediately if hæmorrhage exists; tears of moderate degree may be repaired at once, providing good light and assistance are at hand; otherwise a delay of two or three days does no harm, as the edges can be freshened by gauze and the parts more easily recognised when they are not so œdamatous; and in many instances the patient will be in better condition; plain catgut or chromic, or silkworm gut can be used.

In conclusion I want to say that so-called normal labour cases are very much neglected.

Every obstetric case is an important *surgical* procedure, and should be as carefully prepared as for any laparotomy. Many women date the beginning of their invalidism to a *poorly* managed normal labour. Not enough time is given in many cases to let nature complete the delivery.

The general practitioner must more fully realise his responsibility if he expects to hold his obstetrical practice.

THE TECHNIC OF OPERATION FOR PERINEAL REPAIR

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A great part of the work of an operating gynæcologist consists in the repair of injuries, and the correction of displacements, of the pelvic organs resulting from obstetrical injuries. Very often those cases are only seen years after the initial injury, and then the condition may be so aggravated as to necessitate most extensive operations. A discussion of the various operative procedures for the correction of retro-displacements, prolapse, cystocele and rectocele, would take us very far afield, and we wish to confine our attention at present to an operative procedure which usually forms a very important part of any combined operation for the complete relief of the patient's condition, namely, repair of the perineum.

We shall first discuss what is really the most important, viz. the immediate repair of perineal and vaginal wall lacerations at the time of, or within a few days following, delivery. We are fully aware that there are many other factors in the causation of retro-displacements and prolapse besides laceration of the perineum and the muscles of the pelvic floor. I need only refer to the part which the premature use of forceps plays. Used before the os is fully dilated, the forceps drag the whole cervix and uterus down in the pelvis and cause a diastasis of the important supporting structures, which ultimately results in a retro-displacement or prolapse. The pushing down of the anterior lip of cervix and anterior vaginal wall in front of the head loosens the fascial attachments of the bladder, and results in a cystocele. Subinvolution of the ligaments in the puerperium allows the cervix to fall forwards, and intra-adbominal pressure presses the uterus backwards. All of those things must be taken into consideration in dealing with the prophylaxis of retro-displacements and prolapse. If those conditions are guarded against, and an efficient repair of any laceration is made at the time of delivery, the number of such cases will be very materially diminished. A perineal laceration, without some other factor such as mentioned above, usually does not result in a major degree of prolapse. It may, however, be followed by rectocele, and, owing to the loss of support to the anterior vaginal wall, cystocele.

In performing repair of the pelvic floor after delivery, it is essential to have a clear understanding as to the possible extent of the laceration, and the structures involved. The first thing to remember is that such lacerations almost invariably begin at a point high up in the posterior vaginal wall, and that the laceration, therefore, involves mucous membrane as well as skin, and between the two the musculo-fascial diaphragm of the pelvis. The common tear is a lateral one, the apex in the posterior vaginal wall being to one or other side of the middle line. Sometimes it is bilateral with an apex on each side of the middle line of the vagina, the two tears converging above the outlet of the vagina. Not infrequently there is a very small tear in the skin surface, and a more extensive one involving the posterior vaginal wall and the underlying musculo-fascial structures. The first essential, therefore, in every case is a thorough inspection of the perineum and vaginal wall immediately after delivery. It is not sufficient simply to look at the skin surface. The labia must be separated, the blood wiped away, and a thorough inspection made. When we hear men boasting of having had hundreds of confinements without perineal laceration, we know that no such inspection has been made. The most convenient time to make this careful examination is after the birth of the child and before the expulsion of the placenta. At this time there is comparatively little bleeding, and by introducing a dry, sterile wipe into the lower part of the vagina the whole extent of the tear can be seen. We believe that this, also, is the best time to close the laceration, provided always that there is not too much bleeding, that the light is good, and that the patient can be efficiently anæsthetised and held in the lithotomy position. To attempt repair except under those conditions is to court ultimate disaster. If they can not be obtained, operation should be deferred for two or three days, when adequate arrangements can be made. With the patient in the proper position and anæsthetised, the repair may be proceeded with. The apex of the tear in the vaginal mucosa should be accurately defined and seized with forceps. It should be remembered that the tear in the underlying structures usually extends somewhat higher than that in the vaginal mucosa. It has been our habit for some time past to repair all such lacerations with a continuous buried catgut suture on a full-curved, round Mayo needle. The suture is begun by taking up the tissue above and underneath the apex of the tear in the vaginal mucosa, and it is here knotted. The stitch is then passed from just underneath the edge of the torn mucosa through the deeper structures and out underneath the mucosa on the other side, and so on

from side to side until the mucosa is united by this submucous suture down to the vulvar orifice. When this stage is completed, the vaginal tube is completely restored and there remains the tear in the skin surface leading into a deep cavity between the separated pelvic floor structures. Those structures are, from the depth of the wound towards the surface, the fascial covering of the levator ani, the levator ani, transverse perineal muscles and triangular ligament. As the wound is looked at those definite structures can not be recognised, but when the succeeding sutures are inserted they become much more clearly defined. A second continuous suture is now used, beginning in the depths of the wound and taking up the separated levator muscle and fascia on each side. When the suture comes down to the posterior end of the tear it is continued forwards more superficially, taking up the transverse perineal muscles and the triangular ligament as far as the posterior aspect of the vaginal orifice. The same suture is then passed subcuticularly backwards to the posterior limit of the tear in the skin, thus approximating the skin surface accurately. A double strand of No. O chromic catgut is used throughout.

The great advantages of this method of repair are:

(1) Accurate apposition of the torn edges of mucosa of the posterior vaginal wall, without exposure of sutures in the canal;

(2) Accurate restoration of the muscles of the pelvic floor;

(3) Complete closure of the skin wound without exposure of sutures;

(4) Comfort of the patient and ease of nursing as the result of having no external stitches.

In our experience these advantages far outweigh any risk of trouble from the buried catgut, and the ultimate result is a pelvic floor practically as strong and as elastic as before delivery.

The essential points in any technic for perineal repair are the closure of the wound in the mucosa, the approximation of divided muscular and fascial structures. These ends may be attained by other methods, and we simply give the above as the one which we have so far found most satisfactory. If the operation is postponed for a few days after delivery it can be carried out in exactly the same way. If seven or eight days have elapsed, it may be necessary to freshen up the raw surfaces by removing granulation tissue. The time at which the operation is done will always depend upon circumstances. In hospital practice an immediate repair can almost always be performed. In the patient's home it will often be found

better to postpone operation for a day or two, in order to do it under the best auspices.

When a repair of the pelvic floor is made some months or years after the primary laceration, it is done either for the correction of a rectocele, in which case it may be the only procedure necessary, or because the patient is suffering from retro-displacement and prolapse, in which case it is only one of several operative procedures which may be necessary for the complete correction of the condition. As we said before, time will not permit of discussing what those other procedures may consist in. No matter what they are, repair of the pelvic floor is a necessary adjunct to them. In performing the operation the method we follow is essentially the same as that already detailed for recent laceration. A necessary preliminary is, of course, the free exposure of the divided and retracted structures. This is obtained by an incision round the posterior vaginal orifice at the muco-cutaneous junction. The orifice is held tense by a catgut suture on each side passed from the base of the labium minus to the skin on the inner side of the thigh. When this suture is tied it keeps the vaginal orifice open and the edge tense. The incision round the muco-cutaneous junction is made with scissors, and a flap of the posterior vaginal mucosa is raised up by blunt scissors dissection, care being taken to strike the correct fascial layer. This layer is readily reached towards the sides of the posterior wall, and here the scissors can be passed deeply in and opened freely. Having got to the proper depth on each side, the vaginal wall in the middle line can be raised from the rectum without difficulty by scissors dissection. If a rectocele is present, the rectum is freely stripped from the posterior vaginal wall to beyond the apex of the rectocele. A useful guide in doing this is a small sponge smeared with vaseline inserted into the rectum on a sponge holder. The rectal wall can then be readily bulged up into the wound and its definition made clear. The flap of posterior vaginal wall so raised is held with forceps and the stitching is begun. The forefinger of the left hand is placed against the rectum and pressed backwards. In this way the separated musculo-fascial structures on each side are defined, and a suture is passed from right to left through them over the front of the rectum. A deep grasp of the tissue should be taken. The suture is a double strand of No. O catgut, which is used throughout. It is securely tied and cut short. Above this a second similar suture is passed, which also takes up the under surface of the vaginal wall flap. A third is inserted posterior to the first. Those three sutures are usually sufficient to secure accurate coaptation of the levatores and

their fascia. They securely shut off the rectum. The rest of the stitching is done with one continuous catgut suture. It begins just above the upper stitch in the levator muscles, goes through them and takes up the under surface of the flap. It is continued upwards on the under surface of the flap, pleating it together. At this stage the stay sutures holding the labia apart should be removed. Any excess of tissue in the flap can now be removed, and the stitch, after reaching the apex, is continued downwards just underneath the cut edges of the mucosa, bringing them into accurate apposition, and so completing the posterior vaginal wall and restoring the vaginal tube.

At this stage the posterior vaginal tube is complete. There is a vertical wound in the skin of the perineum, at the bottom of which can be seen the three stitches uniting the levator muscles across the middle line, and on each side a very distinct fascial layer can be seen, consisting of the transverse perineal muscles and the triangular ligament. Those are united from before backwards with the continuous suture, care being taken to pass the needle through the united levator muscles so as to obliterate dead space and prevent hæmatoma. When the posterior extremity of the triangular ligament is reached, the suture is continued forwards subcuticularly bringing skin edges accurately together, and it is tied at the anterior part of the perineum.

On the completion of the operation, vaginal examination shows an orifice admitting two fingers with some difficulty, a perineum and pelvic floor from one and a half to two inches in depth and complete correction of any recocele which may have been present. The employment of a completely buried suture and a fine size of catgut has resulted in more accurate healing with less discharge than formerly, when sutures were tied on the vaginal and skin surfaces. The ultimate results so far obtained have been very satisfactory, and no tendency to separation of the musculo-fascial structures has been observed.

THE LATE REPAIR OF INJURIES DUE TO LABOUR

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The majority of women who have borne children have sustained damage to their pelvic tissues, and are liable to various ensuing disabilities. Such damage is often overlooked at a period when repair would be easy, or when palliative measures would arrest the further progress of the lesion; but even when the injury is recognised, the operative procedures are often not skillfully executed, and so fail to accomplish the desired results, or the palliative measures are inadequately carried out. These facts led to the choice of this topic when you honoured me with an invitation to address you. By the term "late repair" is meant plastic work carried out at any time subsequent to the puerperium, or a few weeks following it.

A large proportion of the work in a gynæcological clinic consists in the repair of injuries sustained in previous child-births, or in correcting the secondary results of such lesions. Not only are such operations called for in those patients who consult us for symptoms directly referable to such injuries, but they are often indicated in patients who present themselves for some other pathological condition, such as fibroid, pyosalpinx, etc., and in whom injuries, sustained at previous labours, represent a potential source of future trouble, even if symptoms have not as yet developed. In such cases it is advisable, and, usually, possible to carry out the repair work in addition to the primary operation.

When one considers the diameter of the undilated cervix, or of the nulliparous outlet, and contrasts with these the size of the fetal head, it seems amazing that within a few hours the former could dilate sufficiently to permit the passage of the head and escape serious injury. Damage does occur in almost every instance, even if careful inspection fail to reveal any surface lacerations. This is particularly true of the anterior vaginal wall. Visible lacerations here are unusual and yet the frequent development of cystocele, even with very little descensus of the uterus, or marked relaxation of the perineum, bears witness to the trauma inflicted upon the supports of the bladder. The posterior wall may present but the slightest of superficial abrasions, or, possibly, none at all, at the confinement, and yet with the best of after care the perineal support, later on, may be found very seriously imparied. In such cases it is absolutely impossible to estimate, at the time of labour, what the ultimate result will be, and I

believe, that in many cases, a patient is better off with a very evident tear, provided it is carefully sutured at once.

It is, however, not as easy to secure satisfactory results from immediate repair, when the tissues are bruised and overstretched, as at a later date. For this reason it may be advisable to delay suturing a complete perineal tear, involving the sphincter ani, for a few days until the tissues have somewhat recovered. When, years later, a woman is told that her condition is due to damage sustained in child-birth, she usually concludes that her accoucheur was to blame in not having repaired the injury. It is quite possible that he was, but not necessarily so. I therefore tell these patients, routinely, that I am not criticising their obstetrician, for such injuries cannot always be prevented, nor can they always be either recognised or corrected at the time.

Not long ago a patient consulted me for symptoms of recent origin, due to trauma in labour forty-two years previously. The great majority of patients with marked prolapse are over forty-five years of age, although the primary lesion probably occurred fifteen or twenty years previously. On the other hand, marked symptoms, such as pelvic drag, backache, etc., may exist with little evidence of relaxation, or displacement, yet the true state of affairs may be shown by the complete relief afforded by a supporting pessary. The perineal support, if imparied, may be compensated to a great extent by a voluntary muscular effort. This soon becomes unconscious, as in eye-strain—at least the two conditions may present identical reflex phenomena. A weakened outlet, in such cases, may not be evident unless the patient can completely relax, and many times it will be revealed only under complete anæsthesia.

It is not always an easy matter to gauge the importance of deficient perineal support. Many women will live to an advanced age with a markedly relaxed outlet and experience no discomfort from it, and never develop any secondary results, such as cystocele, rectocele, descensus, etc. In other patients, the results may be delayed many years, thanks to the vigour and tone of their tissues, which successfully withstand the tendency to stretch, when the perineal support is lacking. The other extreme is represented by patients who, with very slight injuries, promptly develop the secondary changes, long before they would be expected to do so. These patients have also a tendancy to visceroptosis, diastasis of the recti, hernia, etc.

Many of the sufferers from these injuries look forward to the "change of life" in the hope that their pelvic troubles will then abate. While this may be true of some pathological pelvic conditions, it is

certainly not so in this case, and there is more apt to be an aggravation of the trouble as the patient's age increases.

It is unfortunately true that even the relaxation of the pelvic supports is very evident, its existence is often ignored by the operator. I am constantly seeing women who have undergone an abdominal operation for a retrodisplacement, but who have had nothing done for the primary cause, the relaxed outlet. Nor do I know of any operation that is so often badly done as a perineorrhaphy. It is no uncommon thing to have to do over again the work of some operator who has failed to grasp the essentials of this simple operation. In correcting the associated descensus, the inexperienced operator is also very apt to attach the uterus far too high up out of the pelvis, so that the normal uterine supports cannot possibly functionate and the whole weight of the uterus, etc., must be assumed by the new attachments that have been made.

The operative measure for these traumata have been thoroughly worked out, and I shall not attempt to describe them, nor have I any new procedures to offer. The choice of operation depends largely upon the individual case, *e.g.* in one patient a curetting, trachelorrhaphy and perineorrhaphy may be sufficient; in another, an anterior colporrhaphy may also be required; in still another, some intrabdominal work may be necessary; and yet another, a hysterectomy may be indicated. One operator will achieve excellent results from a given procedure, while another will succeed equally well in the same class of cases with an entirely different technic.

Injury to the corpus uteri in labour is seldom encountered, and if so, immediate treatment is demanded. Pathological conditions of the corpus uteri, requiring treatment at a later date, are usually secondary to lesions of the cervix, or outlet.

Injuries to the cervix: It is almost an impossibility for the cervix to dilate sufficiently in labour without receiving some damage. It is uncertain how often this happens, as the cervix is seldom inspected after delivery, unless there be excessive bleeding. Even when it is examined, it is difficult to estimate the extent of the trauma, for an apparently large tear may almost disappear in a few hours, when the cervix has contracted. When conditions are favourable, such as in hospital practise, the immediate repair of cervical injuries of any extent is advisable, but it seems to be generally accepted that in confinements in the home, unless one is absolutely sure of ones technic, or in the case of excessive hæmorrhage, repair had better be postponed. In a week or ten days it can be easily done, and no denudation will then be necessary; but in the vast majority of cases the repair, if done at all, is carried out years afterward.

Many deep lacerations will heal so completely that practically no trace of them is left. Not every laceration requires repair. A deep bilateral tear, even up to the vaginal vault, may be perfectly harmless if the two lips are well covered with the normal squamous epithelium of the portio, if they show no thickening or inflammation, and if there be no ectropion of the cervical mucosa and no follicle formation.

The most common injury is a bilateral tear with one side usually deeper than the other. The raw surfaces of the two lips are soon healed over, but the type of epithelial covering has much to do with the result. The whole vaginal surface of the portio is normally covered with stratified squamous epithelium, devoid of glands and secreting very little, therefore, and offering a very impervious barrier to absorption of any irritants within the vagina. Even if the raw surfaces of the tear fail to unite, but are covered with this protective layer, the lips will probably show little thickening or inflammation, and a minimum of disturbance will occur.

The cervical mucosa, on the other hand, is covered by a single layer of columnar epithelium, beneath which a rich capillary network gives the characteristic bright red colour so distinct from the pale bluish pink of the portio. The columnar epithelium not only covers the surface, but dips down deeply to form the complicated glands which secrete the tenacious mucus of the cervix. This membrane is, therefore, not only a secreting structure, but its rich blood supply and thin epithelial covering, fit it particularly well for absorption. The cervical mucosa will normally cover the central strip on the inner surface of each lip, but it has a tendency to extend over the raw surface of the tear. This means not only an increase in the total secreting area, but also a greater chance for absorption of irritants from the vagina. As a result of this absorption and irritation, the cervix becomes swollen, thickened and everted, the lymphatics in the broad ligaments and pelvis are irritated, and considerable pain may result. The increased size of the cervix means an increased drag upon the supporting ligaments, and corresponding discomfort. The eversion of the lips may be so extreme that the lateral angles of the tear may be obliterated, and the existence of a laceration be entirely overlooked by the inexperienced.

The eversion, or ectropion, of the cervix is commonly referred to as "erosion" or "ulceration," both very incorrect terms. It represents merely an extension of the cervical mucosa beyond its normal bounds, and it can occur even in virgins with cervicitis. In such cases a considerable area of the portio around the intact external os may be covered with cervical mucosa. Under applications of silver

nitrate, etc., the squamous epithelium may be induced to resume its former limits, with the consequent disappearance of the so-called erosion.

The commonest symptom of a lacerated cervix is leucorrhœa, but a great deal of discomfort, if not actual pain, may result. This may be due simply to the added weight of the hypertrophied cervix and subinvoluted corpus, and the consequent drag on the supporting ligaments, but the influence of absorption, and resulting irritation of the pelvic lymphatics is, I believe, responsible for part of the pain, and I have been struck by the prompt relief afforded by a few applications of silver nitrate to such an irritated cervix.

Complicated tears of the cervix may occur. Occasionally the laceration may extend out into the vaginal vault, and even far down the lateral vaginal wall. The resultant cicatrisation and contraction may cause considerable distortion of the organs, and the scar tissue is very apt to be painful.

The torn cervix may become adherent to the lateral vaginal wall, entirely obliterating the lateral fornix. In one case recently seen both sides of the cervix were firmly anchored in the axis of the vagina, preventing the replacement of a retroversion; the obliteration of the lateral fornices also prevented the use of a retroversion pessary. When such scar tissue is found in the vault or along the vaginal wall, it may require resection and suture, but if palliative measures be employed, a thorough stretching and massage, under anæsthesia, may mobilise the structures and relieve pain.

Does the existence of a cervical tear demand operation? Not always. If well covered with squamous epithelium, and not inflamed, it need not be repaired. If thickened and irritated, it may possibly be restored to a harmless condition by appropriate treatment, although the irritation is apt to recur. If the symptoms can be relieved and the pathological condition improved one may wait to operate until the probability of further child-bearing is past. A repaired cervix is more apt to tear than a normal one, and a subsequent labour might demand a repetition of the operation. If the cervix does not respond to treatment, if the cervicitis is apparently causing sterility, or if the extent of the tear is the apparent cause of abortion; the repair should not be postponed. The danger of carcinomatous development in these cervices should also be borne in mind.

The method of repair will depend upon circumstances. In a simple tear a trachelorrhaphy will suffice. In a complicated stellate laceration, or if the cervix will prove too elongated after being sutured, in the case of marked hypertrophy or with much follicle

formation in the portio, an amputation is preferable. This should not be done at too high a level if future pregnancies are likely, or if there is any probability that a retroversion pessary may be required later. The Schroeder operation, which would be applicable in the above conditions, does not seem to me to offer any advantages over the ordinary amputation. In cases of long standing, badly lacerated cervix, with thickened lips and subinvolution of the corpus, a total hysterectomy should be considered. In such, simple repair is apt to be disappointing, especially after the age of thirty-five. More and more am I convinced that in women near, or past, menopause or if no more children are desired, it is better to remove the uterus completely than to have a patched up damaged organ.

Other traumata can occur in the cervix, but their rarity does not warrant their consideration here.

Injury of the anterior wall may be quite marked yet with very little descensus, especially when the uterus may have become fixed by an inflammatory process. On the other hand there may be very little stretching of the anterior wall, yet it has sagged down owing to the prolapsus uteri. The cystocele is responsible for much discomfort, in that it leads to frequent micturition, bladder irritability, incontinence or cystitis. A very early suggestive symptom is slight leakage of urine on suddenly straining, as in sneezing or coughing.

The condition is often ignored when repair work is carried out, and the bladder symptoms may therefore persist and the cystocele increase in size, even when a satisfactory perineorrhaphy has been done. It may be likened to the sac of a hernia. If not resected when the hernial opening is narrowed, it is apt to push down through the repaired outlet and redilate it. In like manner there is no more sense in repairing a cystocele and neglecting to furnish a good perineal support, than in resecting the sac of an inguinal hernia and leaving the hernial opening untouched.

The thinness of the vesico-vaginal septum renders the repair rather difficult, in that there is little tissue available in which the sutures can secure a firm hold. It can be overcome by using buried mattress sutures of chromic catgut. Upon each side of the oval denudation the needle is passed in a fairly wide sweep immediately beneath the vaginal mucosa. A firm hold of tissue is thus obtained, without having to pass the needle in the denuded area, and penetration of the bladder can be easily avoided. After tying these sutures, the edges of the mucosa lie in close approximation, and need only a running stitch of plain catgut to complete the operation. The circular stitch used in the Stoltz operation is apt to result in too much

shortening of the anterior vaginal wall, pulling the cervix downward and throwing the uterus into retroversion. An oval denudation, closed from side to side, seems to be preferable.

If the cystocele be due merely to the descensus of the uterus and there be no actual stretching of the anterior vaginal wall, maintaining the uterus at its normal level will abolish the cystocele, and no plastic work on the anterior wall will be required.

In very marked cases of cystocele an ordinary denudation and suture is not sufficient, but it is necessary to freely separate the vaginal mucosa from the bladder and the bladder from the front of the uterus. The bladder is then pushed upward to its normal level, and its base supported by suturing it to the uterus or broad ligaments, or by performing a Watkins' interposition operation.

Damage to the perineum is by far the most common injury due to labour. Cystocele, rectocele, descensus and retro-displacement of the uterus, while possible with an intact perineum, are almost always secondary to a relaxed outlet. The pelvic floor may be called the inferior abdominal wall, and it is, in many respects, like the anterior. Each has a muscular and fascial layer. In the pelvic floor these are the levator ani and levator fascia. Other structures, such as the transversus perinei muscles, also exist, but so far as perineal repair is concerned, the edges of the levators, together with their fascial covering, are the important structures. Exposure of the edges of these muscles and suture of them together in the mid line, from close in front of the anus to a point well under the pubic arch, will restore the perineal support perfectly, while failure to approximate them will give an unsatisfactory result. These muscles are often deeply placed, and the inexperienced operator may neither expose them properly nor pass his sutures deeply enough to grasp them. The relaxed outlet is really a hernia, and the same care should be exercised in coapting the strain-bearing tissues of the pelvic floor as in the case of the anterior abdominal wall in inguinal or ventral hernia.

If the edges lie widely separated they will be under considerable tension when sutured together. This tension may be lessened by massaging and stretching the muscles before approximating them. Buried sutures of chromic catgut are necessary. If through and through sutures alone are used the lateral pull of the muscles will cause the knot upon the perineal surface to sink deeply in, and the loop of the suture to be elongated, thus permitting a separation of the muscle edges. The injury at labour may have been so severe, or a subsequent cellulitis may have so damaged the muscle on one or both sides, that the edges cannot easily be felt. Careful dissection

will usually disclose them and allow them to be freed from the scar tissue so that they may be approximated. In one patient of mine the vaginal mucosa and underlying tissues were firmly adherent to each lateral pelvic wall, and no trace of the levator edges could be made out. I was anxious to see what could be done, either by the routine method or some other, but was refused permission to operate, as I would not guarantee a perfect result. In no other case has it proved impossible to unite the levators.

The question of how high up under the pubic arch the muscles should be united will depend upon circumstances. After the menopause, or when further child-bearing is unlikely, a narrower outlet is permissible than if more cildren are expected. The outlet will always relax somewhat after the operation, and, even if it prove too small, it can be easily dilated, while if it be too relaxed it can be narrowed only by a further operation. When no future labour is expected, I find that the end result is good if the edges of the muscles are united so that the index finger alone will fill the new vaginal outlet.

Ocassionally one will meet with a long neglected perineal tear extending through the sphincter ani. The condition may have existed for twenty or thirty years, and the sphincter ends are deeply retracted and the muscle itself more or less atrophied from disuse. More or less prolapse of the rectal mucosa may also exist. It is surprising what a measure of control over defecation these patients may obtain by keeping the bowels constipated. The perineal repair in these cases must be modified by first uniting the edges of the rectal mucosa down to the sphincter, and then by exposing the ends of the sphincter and suturing them together. The perineal repair then proceeds as in a simple case. Very satisfactory results are obtained even when the sphincter ani has been completely out of commission for years.

Let me emphasise that the perenial repair is the all-important step in most of these cases of injury due to labour, and that approximation of the levator edges and the levator fascia is the essential part of this operation.

Secondary results of the foregoing injuries: Descensus of the uterus is the most frequent, and is usually due to a relaxed outlet. The whole weight of the uterus, together with the downward thrust of the intraabdominal pressure then falls upon the broad ligaments and other uterine supports, which were never meant to stand this strain. The weight of the uterus is often increased from the hypertrophy of the lacerated cervix and subinvolution of the corpus. This undue drag upon the ligaments accounts for much of the distress and pain with this condition.

Following the descensus a retro-displacement is highly probable, with still further engorgement of the uterus from obstruction to the venous return flow, and consequent aggravation of the symptoms. The ovaries, carried back with the uterus, become prolapsed and painful. The descensus continuing, a prolapse is the next step, which may become more and more marked until the whole womb protrudes from the vulva.

As the uterus descends the bladder accompanies it and a cystocele develops, even when the vesico-vaginal septum has not been overstretched or injured. Rectocele is less apt to be due to the descensus than to the relaxed perineum. The pouching of the recto-vaginal wall interferes greatly with the expulsive efforts in defecation, and constipation and hæmorrhoid formation are the usual sequelæ.

When shall we advise operative and when palliative measures? If more children are desired, and if the symptoms can be abated, and if the development of secondary changes can be prevented, one may advise palliative measures, such as pessaries, until the reproductive period is past. If the operative treatment cannot be postponed its execution does not impair the child-bearing function, but distinctly improves it, and it is quite possible that the repair work may escape damage in subsequent deliveries. In very old patients, or in those with marked arteriosclerosis, venal or cardiac disease, or diabetes, the operative risk may be too great, and recourse must be had to other methods. It must be borne in mind, however, that with advancing age the vagina may become so altered in shape, or the tissues so susceptible to irritation, that pessaries, which heretofore had given relief, can no longer be used.

Very recently a patient, aged forty-five, consulted me, desiring an operation for prolapse. Examination showed a very high blood pressure, albuminuria and casts and retinal hæmorrhages. Palliative measures were advised therefore. Within a week she had a fatal cerebral hæmorrhage, which surely would have been blamed upon the operation if it had been done.

If there be any suggestion of malignancy, however, greater operative risks must be run, and any of the above-mentioned handicaps must be generously discounted in advising an operation.

Palliative measures: Although somewhat beyond the scope of the title of this paper, I shall refer to them briefly. They include local treatment of an irritated lacerated cervix; replacement of the uterus to its normal position and maintenance of it at the normal level so that no undue strain fall upon the uterine ligaments; and adequate support for the cystocele or rectocele. The treatment of the cervix

includes douches, applications of silver nitrate, iodin, etc., the use of glycerinated tampons or vaginal suppositories of boroglycerid, and the evacuation of nabothian follicles. The local condition can be very much improved by these means. The uterus is best held in place by a pessary which transmits its weight to the remains of the pelvic floor and prevents a descensus. The Smith pessary is a very satisfactory type, but individual cases may require a modification of this model. For the cystocele some special form of pessary, of which there are many different patterns, may be used, but a vulcanised rubber ring, shaped like a doughnut, and as large as can be comfortably worn in the vagina, generally proves useful in supporting the cystocele and rectocele. The inflated rubber rings usually collapse, and the solid, soft-rubber rings soon lose their shape and become foul. If pessaries either cannot be retained or cause irritation, cotton tampons are very useful, but must be changed daily. The patient may be able to do this herself, but they are best inserted by a nurse or one of the family, with the patient in the knee-chest posture. The ultimate resort is a cup and stem pessary, the support in this case being transferred to a belt around the waist. This pessary often causes ulceration of the cervix and vagina and then has to be abandoned.

Operative measures: The simplest procedures are curetting, trachelorrhaphy, anterior colporrhaphy and perineorrhaphy. One or more of these may be required in a given case. The technic of these is pretty well standardised, and need not be detailed here. A curetting is advisable in practically all cases lest a pathological condition such as polypus, hypertrophy of the mucosa, or early carcinoma be overlooked. During the curetting, if the uterus be palpated bimanually while a large Hegar uterine dilator is in the uterine cavity, small fibroids may be detected, which might otherwise escape observation. Instead of trachelorrhaphy, a cervical amputation may be preferable. Scar tissue in the vaginal vault may demand resection and suture, or merely incision and stretching, so as to render a fixed uterus freely movable without causing pain.

If there be no descensus, prolapse or retro-displacement, the above procedures are sufficient, but if these secondary conditions exist they must also be corrected. After repair of the primary injuries the uterine ligaments would generally regain their tone if the uterus could be maintained in its normal position for a time. A pessary would do this admirably in most cases, but, unfortunately, cannot be used very well immediately after a perineorrhaphy. Additional work upon the uterine supports may, therefore, be required. If done *per vaginam* they must precede the perineal repair, if by the abdominal

route they can be done at the same sitting as the vaginal work, provided the patient's condition will permit it, if not, the abdominal operation may be completed a few days later. I prefer to do all the vaginal work first, because it would be risky to drag down the cervix to repair it after any operation upon the uterine supports. Then, too, the shock from the abdominal procedure is greater than that from the vaginal, and it is unwise to continue the work any longer than possible after the infliction of the principal trauma of the operation.

There is a wide choice of procedures available in dealing with the uterus. Nearly every operator has devised some special method, or some modification of some other operator's method, and a discussion of their relative merits would take far too much time. The vaginal and the abdominal routes each offer certain advantages. Probably the first point to be decided is, what shall be done with the uterus? Personally I am becoming more and more radical in advising removal of the uterus if the child-bearing function is past. It is then practically a useless organ, if not a possible source of future trouble. Its removal solves the vexed question as to which of the many round ligament operations, suspensions or fixations shall be employed, and a hysterectomy will take no longer than a difficult trachelorrhaphy or amputation, followed by some intraabdominal ligament operation. One or both ovaries can be left to prevent the sudden onset of the menopause, if it has not yet occurred, and the patient is very glad to be free from the periods if she is assured that her health will not suffer by the suppression of the menses. The patient will often refuse a hysterectomy, in which case the responsibility for the ultimate result must rest with her.

If an interpostion operation of the Watkins' type is to be used, the uterus must, of course, be retained (I might say that I have had no personal experience with this operation). My own preference is for the abdominal route. Complications, such as adhesions, tubal disease, etc., are more readily dealt with, the appendix can be removed and the gall-bladder palpated. A supravaginal hysterectomy can be easily performed, and the cervical mucosa almost entirely enucleated. If there be a diseased cervix, a total hysterectomy is advisable. With a supravaginal hysterectomy, the ends of the round ligaments and the upper part of the broad ligaments should be sutured to the stump of the cervix to prevent descensus, or, in cases of marked prolapse, the cervix may be attached to the anterior abdominal wall. Particularly in a total hysterectomy is it necessary to support the vaginal vault and the bladder by suturing them to the united bases of the broad ligaments and the ends of the round ligaments. In the course

of such an operation a cystocele of moderate size may be dealt with from above by dissecting the bladder from the anterior vaginal wall, pulling and trimming off the excess of the latter before closing the vaginal vault, and by suturing the base of the bladder to the united broad ligaments. As this does not restore the triangular ligament, a firm perineal support from below is required, and the procedure should not be depended upon if the cystocele be at all marked or the vesico-vaginal septum much thinned out.

Either type of abdominal hysterectomy is far easier than a vaginal hysterectomy, unless there be almost a complete prolapse. If the uterus cannot be pulled down within easy reach it is apt to be very difficult to tie off and suture together the broad ligaments, and this is the only safe method. The use of clamps in vaginal hysterectomy belongs to the dark ages of surgery. It is dangerous, the subsequent lack of support to the vaginal vault and bladder invites a later prolapse, and the only excuse for their use is when rapidity of action is essential, and the removal of the uterus, and not the repair work, is the primary consideration. The vaginal operation is attended with less shock, and this route is advantageous in very fat patients, but even so, if the uterus is difficult of access from below, the abdominal route will usually prove the easier.

The usual plan of procedure would be as follows if the uterus is to be retained: With the uterus in nearly normal position a curetting, repair or amputation of the cervix, if called for, anterior colporrhaphy, if needed, and perineorrhaphy should be done.

With a marked descensus, or even prolapse or a retro-displacement, the above procedures should be followed by an abdominal section and some form of suspension or fixation. I generally use a Kelly suspension, in spite of its general condemnation, and have good results, nor have I known of any ill effects follow in subsequent labours. The failure of this operation is generally due to its faulty performance. When the tissues are very lax and loose, and no further pregnancy will occur, a fixation of the fundus to the abdominal wall may be desirable. In such cases I bring the fundus up between the separated edges of the peritoneum and recti muscles and suture it firmly to the fascia. If an abdominal operation is refused, or seem inadvisable, excellent results may be obtained by dissecting the vaginal mucosa, and then the bladder, away from the supravaginal cervix, pushing the bladder upward and suturing its base to the broad ligaments, which have been pulled across and sutured together in the mid line in front of the cervix. By this means the cervix is pushed backward, and the uterus and bladder lifted up by the shortening of

the broad ligament sling extending from side to side of the pelvis. An interposition operation would also be suitable in such a condition.

If the uterus is to be removed, the plastic operations can first be performed, omitting any repair of the cervix if a total hysterectomy is to be done. An abdominal hysterectomy follows, with suture of the severed ligaments to the stump of the cervix, or, if the whole uterus be removed, to the vaginal vault and base of the bladder. The vault may be completely closed, or a small opening left for a cigarette drain leading into the vagina.

If a vaginal hysterectomy is to be performed, the severed round and broad ligaments must be tied off securely and then sutured together. To them the base of the bladder and the vaginal vault must be attached to prevent any prolapse later. The mucosa of the anterior wall, which has been dissected free and trimmed off, is then closed, and a perineorrhaphy completes the operation.

In conclusion, I wish to emphasise the results of neglect in repairing these injuries. We have all seen the miserable condition of some old women with complete prolapse, cystitis, etc., who are then too old and feeble to undergo operation, and who have had to abandon the use of pessaries, which previously had afforded relief. Lest these conditions develop, have less hesitation in advising operative repair work at a stage when the operation offers a fair operative risk, and do not temporise with palliative measures until they can no longer be used and the advanced age of the patient makes operation too dangerous.

Report of fifty-three cases of carcinoma of the uterus (no cases seen in last twelve months included):

Operability	27 cases, or	51 %
Still living	23 " "	43.4%
Of these 1 living over 5 years		
3 " " 4 "		
2 " " 3 "		
7 " " 2 "		
10 " " 1 "		
Carcinoma of the cervix	47	
" " body	6	
" associated with fibroid	2	

I.

(1) Cases subjected to hysterectomy	26	
Primary mortality	2 or	7.7%
Have died since operation	6	
Living and well	18 or	69.2%

II.

Cases treated by radical abdominal hysterectomy (Wertheim)...14

Primary death .....1 or 7.14%

(12 days after operation of cerebral embolus)

Cases died since operation 5

1 died in 4 years 3 months (Graham) recurrence in stomach
1 " 8 months (Payne) local recurrence
1 " 9 " (Goddard) brain metastases
1 " 4 " (Biggar) "suddenly"
1 " 6 " (Arnold) brain metastases

Cases still living with no sign of recurrence 8, or 57.1%
Of these 2 living more than 4 years since operation
3 " " " 2 " " "
3 " " " 1 " " "

III.

Cases by ordinary abdominal hysterectomy 10

Primary mortality .....1 or 10%

(Died in 6 days of peritonitis)

1 died 1 year 9 months after operation
8, or 80%, still living.
Of these 1 living more than 5 years
3 " " " 2 "
4 " " " 1 "

IV.

Cases treated by vaginal hysterectomy 2

Both living
1 over 4 years
1 " 2 "

V.

Cases where hysterectomy could not be done or was inadvisable. 27

Treated by Paquelin cautery alone 3

(All died within a few weeks.)

Treated by partial hysterectomy and tying off blood supply..... 2

1 lived 4 months
1 " 6 "

Treated by Percy cautery 22

Primary mortality .....5, or 22.7%
Known to have died since 10
Lost track of 2, probably dead.
Known to be alive 5

Of these 2 living over 3 years (Pym)
(Da Costa)
3 " " 1 " (Piggins)
(Charters)
(Richardson)

Of these 1 case, living over 3 years, was operable but refused hysterectomy.

Of those who died,
1 lived 1 year 11 months (Munro)
1 " 2 " (Elliott)

Of those who died,
1 lived 1 year (Etzell)
1 " (Pike)
1 " 9 months (Crawford)
1 " 9 " (Richardson)
1 " 8 " (Clemens)
1 " 2 " (Briggs) brain metastæ
(The others lived a few months.)

Campaign necessary.
Internal iliacs tied in 18 cases.
inclusive of Percy cautery cases.
First done, January 12th, 1914.
Elimination of primary dangers,
Hæmorrhage,
Sepsis,
Shock.
Elimination of secondary dangers.
Implantation.
Poor operative risks.
Proper preparation.
Good after care.

Operability.

In 1911 Jacobson, of Toledo, Ohio, collected 2,765 cases of carcimona of uterus—2,467 from European literature, 298 reports of American surgeons.

European surgeon average operability 67.17%
American surgeon " " .....35 %
Report from the Munich clinic.....68.9 %
Report from the Johns Hopkins Hospital .....54 %
Wortheim's clinic during 14 years .....50 %
From 1902-1912 Peterson, of Detroit, examined.
218 cases with operability of only .....23 %
Taussig reports 115 cases, with operability of only .....19 %

Primary Mortality.

Average primary mortality of European surgeons with Wortheim's operation 19.94%

American surgeons 15.77%

Taylor of New York reports 28 cases, with primary mortality of 11%, but only 257 of his cases were alive and well 2 years after operation.

Peterson reports 59 cases with S.G. & O. September, 1916, primary mortality of .....25.4 %

Taussig reports 60 cases, with primary mortality of 30%, and these were twelve recurrences within the first year.

At Johns Hopkins Hospital they had 136 cases, with a primary mortality of .....20.5 %

SECTION IV

PAEDIATRICS

ASTHMA IN INFANCY AND CHILDHOOD

ISAAC A. ABT, M.D., CHICAGO

The subject of asthma in infants and young children is not a new one, though in recent times extensive clinical observations have been added to previous knowledge, and new theories have been advanced as to ætiology and the nature of the disease. In the hope of presenting the more important facts as to the status of this disease, I have collected some of my own case records and have attempted to explain them on the basis of recent knowledge.

I desire, therefore, to call attention to a typical case which presents the following history:

W.K., male, six and one-half years old, came to the hospital February 3, 1918. He has been suffering from frequent attacks of bronchitis with marked dyspnœa, associated with vomiting. The father thinks they are brought on by indiscretions in diet. The first attack, which occurred four years ago, followed upon eating a portion of an egg. The symptoms noted at the time were cyanosis and dyspnœa, occurring at night, accompanied by great restlessness, nausea, and vomiting. It is thought that similar attacks occurred after eating fish. Both of these articles, therefore, have been excluded from the diet. The attacks, nevertheless, recur at intervals, coming on especially at night, about one-half hour after going to bed, and lasting about ten minutes. They are associated with coughing. At the end of the seizure, the patient usually vomits. The dyspnœic attacks occur frequently while he is at school.

When the little fellow was six months old he had a severe attack of eczema. At three, he had whooping cough. The mother states that she herself invariably has a rash after eating strawberries or after some indiscretion in diet. The father, who is a physician, is in good health.

The physical examination of the chest shows an emphysematous condition of the lungs. The heart is slightly dilated to the right. The examination of the blood shows 85% hæmoglobin, 4,670,000 red cells, 9,400 white blood cells, of which fifty-three are polymorphonuclear, thirty-eight small mononuclears, five large mononuclears, and four eosinophils. Tuberculin tests are negative. The X-ray examination of the thorax shows some striations extending out to the periphery, which probably indicate chronic bronchitis.

The story contained in this case record is one that is frequently encountered. Numerous histories might be taken from the records of the hospital which would simply be a repetition of the foregoing. The history here cited is obviously one of bronchial asthma; and it is to this disease, particularly as it occurs in infancy and childhood, that I wish to direct your attention.

Asthma is characterised by attacks of severe spasmodic dyspnœa, which may be preceded, accompanied, or followed by a bronchitis of varying degrees of severity. In infancy, the association of asthma with bronchitis is a very close one. In older children, the disease presents quite another clinical picture, which varies in no essential points from the asthma of adults.

So far as age incidence is concerned, LaFétra tells us that in three cases the symptoms were noted at birth. During the first three months of life, he noted two cases; from the third to the sixth month, three cases; and from the sixth to the twelfth month of life, three cases. During the second year, he had eight cases; from the second to the fifth year, nine cases; and from the fifth to the twelfth year, fifteen cases.

Not infrequently there is a familial occurrence of the disease. It is not uncommon to be told by the mother or father that several children were asthmatic, or to be informed that the disease has existed in the parents or in some other member of the family.

It is important to emphasize the fact that the infantile asthma differs from the type that occurs in adults and in older children. For this reason, the disease is often unrecognized in infancy. I have not infrequently observed well developed cases of asthma that were diagnosed as bronchitis or even as bronchopneumonia.

It is often stated that asthma is more common in boys than in girls. It occurs among children of all classes, particularly among the well-to-do, especially those with neuropathic tendencies. It may occur at any season. It is very frequent during the fall and winter, when grip and bronchitis are prevalent, and it is also apt to appear in the summer time during the hay fever season. It is interesting to note

that children who are sent from severe winter weather into climates that are warm and dry tend, either to improve markedly, or at least to recover temporarily. I have in mind an infant who was suffering severely from asthma during the time that the family lived along the shore of Lake Michigan, who showed marked improvement after he had been removed to a home some five or six miles inland.

The effect of locality illustrates the capriciousness of the disease. Some patients do best in a dry place, while others avoid the ailment by living in a moist atmosphere. Knopf, who examined 5,000 children at the Strassburg Polyclinic, found no cases of asthma among them. He attributes the absence of the disease to the moist air of that region.

High locality affords relief to some patients, while to others relief comes only in a low region. In some, the disease is avoided by remaining inland; in others, by dwelling at the seaside. It is noted at times that patients become asthmatic only when they visit a certain place, and that at other times they are free of the disease only when they visit another certain place. Sometimes an asthmatic patient can live on one street of a town and not on another. Health and illness may even be a matter of living in certain parts of the same house. In one room the patient is free of asthma; in another, he succumbs to it. In short, it seems impossible to lay down any definite rules as to the influence of locality on the disease. It occurs everywhere, in all places and in all climates; in rural as well as in urban districts; in the mountains as well as at the sea level.

The same capriciousness is evident in the influence of the seasonal changes. One case grows worse only in the winter; another, only in summer. It has already been stated that climatic conditions which predispose children to "grippal" infections and bronchitis also produce asthma. Almost in the same breath, I may state that I have frequently seen children with severe attacks of the disease in the hot, dry spells of the summer, when the dry heat produces new patches of eczema as well as asthma.

Much interest attaches to the exciting cause of asthma. As in most diseases, which are of obscure origin, numerous hypotheses are offered as to ætiology. There are some who believe that bacteria or their toxins may have some influence in the production of the disease. Koessler and Moody made an extensive study of the bacterial flora of the sputum of asthmatics. In twenty-eight cases that they investigated, they found in addition to the aërobic organisms, the pneumococcus, the streptococcus, the influenza bacillus, micrococcus catarrhalis, and certain anaërobic bacteria which they classed under three heads: "(1) a gram-negative fusiform-like bacillus which produces a putrefactive

odour in the culture; (2) a gram-negative, very small bacillus which produces characteristic black colonies in the blood agar; and (3), a very small streptococcus. These three organisms live in a certain form of symbiosis and are in every case present in the anaërobic tube."

These authors also state that they find a certain form of "asthma bronchitis due to the *tubercle bacillus* which can only be demonstrated by guinea pig inoculation. Berkhart found tubercle bacilli in five cases. Others report similar findings."

It has been held that asthma may be the expression of an anaphylactic reaction to certain bacterial poisons. Nevertheless, it has been demonstrated that after injecting autogenous vaccines containing the proteins which caused the anaphylaxis, an attack of asthma does not follow. If the bronchial musculature in man acts the same as it does in a guinea pig, a second injection of protein, even though it be small, should produce a spasm of the bronchial musculature, just as it does in the guinea pig. This reaction, however, does not occur. Children, it may be said, are more apt to exhibit anaphylactic phenomena than adults. This increased susceptibility is due either to the greater absorptive power of the gastric mucous membrane in children, or to the acquisition of a partial immunity by adults.

The work of Talbot, Walker, Oscar Schloss, Goodale, Cook, and others, have taught us that a certain group of children are susceptible to the toxic effects produced by eggs and other protein substances. These toxic symptoms are in the nature of anaphylaxis. Thus when a foreign protein is administered, the body becomes sensitized, and a subsequent dose of the same protein causes symptoms of anaphylaxis. Talbot tells us, however, that an injury to the intestinal mucosa is necessary in most cases before the reaction can take place, and that the greater the injury and the younger the infant, the more easily can the foreign protein pass through. It may even be assumed that in young infants the protein may permeate an intact mucous membrane. It is obvious, therefore, that sensitization can be most readily accomplished in early childhood. Thus an infant may be rendered susceptible to the toxins produced by proteins because of an inherited tendency to anaphylaxis; or it may become sensitized through an insult to the alimentary tract occurring either during the first days of life or later in infancy. It may be said, then, that in some infants and children, asthma is a manifestation of anaphylaxis produced by protein substances which act as toxins.

I have frequently seen children, in private as well as in hospital, practice in whom attacks would be produced by ingestion of egg albumen. In one of the patients, a little girl of seven, who suffered

from recurrent seizures of asthma, an immediate attack could be produced by ingesting the minutest portion of egg contained in cake, in bread, or in any other article of food. This child also responded to the skin test. If a small portion of egg white was placed on the skin, and the integument abraded with a scarifier, an intense localised urticarial reaction would occur in a few moments. In this instance, the asthma would occur in response to a variety of causes. Other protein substances were capable of producing an attack, such as the pollen of plants, nuts, and the emanations from certain animals. Milk may occasionally affect certain individuals in the same way.

It should be noted that the foreign protein may enter the body in various ways. It may pass through the mucous membranes by inhalation, by ingestion, or by autolysis of bacterial proteids coming in contact with mucous surfaces. The method of entrance by inhalation may be seasonal or perennial. Seasonal inhalation, or hay fever, produces symptoms at a definite time, coinciding with the flowering of special plants; while in perennial inhalation, the exciting protein enters the body at any time and may produce asthmatic attacks. The emanations from horses, dogs, and cats are examples of this variety. Patients who are sensitized to animal substances, such as epidermal scales, hairs of animals, or feathers of birds, may show a group of symptoms varying from rhinitis to a severe asthma. Asthma may be caused also by vegetable substances in which the exciting proteid is other than pollen, for example, flour, potato, face powder, or powdered orris root.

Ingestion Reactions.

Various substances, such as fish, eggs, milk, meat, grains, cocoa, potato, or nuts, may produce symptoms which vary from tickling in the throat to urticaria, asthma, or eczema. There is also a form of vasomotor disturbances in which the protein is bacterial. Walker has shown in examining the sputum of asthmatic patients, that a diphtheroid organism is often found, and that the staphylococcus pyogenes aureus is of very frequent occurrence. Whether these organisms act directly by producing irritation and inflammation of the mucous membrane, or indirectly by liberating protein substances which may be absorbed as foreign albumens, has not been definitely settled. If it can be affirmed that definite sensitization to microörganisms exists, it is obvious that the use of vaccines would be valuable in treatment.

The Relation of Asthma to Exudative Diathesis.

A group of clinicians, foremost among whom is Czerny, have

attempted to explain a certain clinical entity under the caption of exudative diathesis. It is known clinically that asthmatic individuals, particularly children, may suffer not only from disorders of the bronchi, but from other organs as well. On the basis of clinical observations, it is attempted to establish a connection between asthma and exudative processes, such as eczema and urticaria. Czerny defines the exudative diathesis as a change in the chemistry of the organism which is caused by a congenitally low tolerance to fat. In considering the exudative diathesis as it affects the respiratory tract, he compares it to measles. This disease produces an exanthem and an enanthem. The exanthem may be compared to eczema; the enanthem, to the catarrhal symptoms of nose, throat, and bronchi, which occur so commonly in exudative diathesis. Continuing, he says, that if an infant shows neuropathic tendencies, or is hyperexcitable, the mild picture of bronchitis will be replaced by the more alarming condition of asthma. Again, comparing asthma to affections of the external skin, he believes that the same nervousness which tends to produce asthma will produce the intense itching in an eczema, whereas in the absence of nervousness, a mild eczema without itching is nearly always observed. Czerny then proceeds to prove his hypothesis by diminishing the amount of milk in the food and by abolishing eggs from the diet.

It will be said at once that this clinical conception of exudative diathesis is not based on experimental proof; that it is merely a speculation; and, while it serves as a working hypothesis for carrying out certain lines of treatment, it has no foundation in pathology. Like all hypothetical considerations, however, it is useful as a temporary classification and serves as a basis for treatment. It is to be doubted whether it will have a permanent place in nosology.

It is possible that many of the obscure, irritative coughs, without ascertainable physical signs, depend upon an itching condition in the throat similar to that which occurs on the skin as a result of eczema. Similarly, pseudo-croup may be the result of an angio-neurotic œdema.

Relation of Asthma to Other Diseases—Broncho-tetany

R. Lederer (*Zeitschrift für Kinderheilkunde,* Vol. VII., p. 129), calls attention to the relation of spasmophilia to bronchial spasm. In children suffering from spasmophilia, the bronchial muscles are frequently subjected to tonic spasm, as a result of which there seems to be closure of the bronchi, more particularly of the smallest branches which communicate with the alveoli, causing a closure of the minute air vessels. In consequence, the alveoli collapse and atelectasis occurs.

This condition may occur alone or may be associated with other constitutional manifestations of spasmophilia. One may conceive it as being analagous to the œdema which occurs in association with the carpal and pedal spasm in tetany, *i.e.* an œdema of the bronchial mucosa. Or indeed, it may be assumed that free fluid is poured into the lumen of the bronchi.

Concerning the frequency of broncho-tetany, we may quote Lederer's figures, 5,903 cases were treated in the hospital and 767 were treated in the dispensary during one year. Of this number, fifty-eight cases of spasmophilia came under observation. The youngest patient was two months and the oldest three years. Of these fifty-eight cases, six, or about 10%, showed spasmodic symptoms of the bronchial-musculature. These children responded to the electrical tests and the Chvostek and Trousseau signs, characteristic for tetany. Of the six cases which Lederer reports as broncho-tetany, all terminated fatally. The children all showed the typical symptoms of tetany, such as laryngismus stridulous, general convulsions, carpo pedal spasms, Chvostek sign, and an increased electrical excitability.

The condition of children suffering from the so-called broncho-tetany is typical. The breathing is laboured and gasping. The alæ nasi dilate; and there is marked retraction of the ribs and the sternum, which indicates the laboured character of the breathing. Physical examination shows dulness over the posterior portion of the thorax, which extends forward into the axillæ. Over the anterior portion, the resonance is almost tympanitic in character. The lower margins of the lungs have descended, and the heart dulness is almost obscured by lung resonance.

Over the dull area posteriorly, bronchial breathing is heard; anteriorly, vesicular breathing is elicited. The temperature varies from 100.5% to 102° Fahr. The condition remains unchanged for about three days. On the third day, the cyanosis is extreme, the breathing is accelerated and noisy, and may be heard at a distance. Over the dull area, numerous small and middle sized râles may be heard, and with increasing cyanosis, dyspnœa, and cardiac weakness, death usually takes place.

At other times, children may show manifest rickets with gastro-intestinal symptoms and with moderate spasmophilia. There may have been for several days indication of bronchial spasm, as shown by the severe dyspnœa, dilatation of the alæ nasi, retraction of the thorax, and loud respiratory sounds. Eventually, an attack of laryngismus occurs, which is severe and protracted and usually ends in death. Occasionally, the attacks show interruptions. They tend to repeat

themselves, with manifestations already referred to. Eventually, symptoms of asphyxia occur, leading to a lethal result.

The diagnosis presents great difficulties, especially as between a bronchial spasm and pneumonia. The explanation of the dulness which occurs posteriorly in these cases has been shown to be due to an atelectasis of the lung tissue. The X-ray examination tends to assist markedly in the differentiation. The picture lacks evidence of infiltration which characterises a pneumonia. It shows well circumscribed shadows between which dark tissue is situated.

The cases which have come to autopsy have shown characteristic pulmonary atelectasis. The posterior parts of the lung are of a dark, bluish-red colour; the surface is smooth and shiny; and the consistency is increased. The bluish-red colour may involve an entire lobe or may be limited to smaller areas. In the regions which have not collapsed, a vicarious emphysema is observed. The location of the atelectatic areas correspond with the region which was dull upon percussion.

The microscopic examination shows that the walls of the alveoli have collapsed and lie close together, and that the lumen has been obliterated. The contained cells have the character of normal endothelium. The blood vessels show an increased content of blood, but nowhere is there any sign of active inflammation. Round cell infiltration, which would indicate a possible pneumonia, is entirely absent. The bronchi show normal epithelial structure and no inflammatory secretion in their lumen.

Broncho-tetany depends upon a spasm of the unstriped muscles of the bronchial tubes. In may be compared to the condition which causes carpopedal spasm. Owing to the spasm, the lumen of the bronchi becomes obliterated, and the communicating alveoli are cut off from their air supply. Since these conditions may last for hours, days, or even longer, the contained air is resorbed, the alveoli collapse, and their walls come in contact. In other words, the lungs become atelectatic. The atelectasis may occur either in small areas or be diffusely spread over a considerable portion of the lung.

Lederer considers broncho-tetany distinct from asthma, principally because it begins differently, and also because it remains uninfluenced by the administration of adrenalin. On the other hand, the differentiation of bronchotetany and asthma is not so simple a matter as Lederer would have us believe. Bronchotetany has many more points of resemblance to asthma than it has to bronchopneumonia. The most characteristic sign of bronchotetany is the extreme dyspnœa. A large part of the bronchial musculature is in severe tonic spasm, so that the entrance of air and oxygen into the lungs is prevented. The

occurrence of atelectasis is a secondary affair, due to the bronchial spasm. It is also true that mild forms of bronchotetany may occur, involving smaller portions of the lung with less extensive atelectasis.

It is a well known fact that asthma occurs in two forms, first, the genuine asthma, which is not found frequently in young infants; and, secondly, an asthmatic bronchitis. The first form, *i.e.* the genuine asthma, may present the same symptoms as the bronchotetany without the extensive dulness. On the other hand, it is not conclusively shown that the asthmatic bronchitis may not, in some instances, depend upon spasmophilia. The important point is that a clinical asthma may occur on the basis of spasmophilia.

Asthma Associated With Nasal Lesions.

It is maintained that nasal lesions, such as occur, for example, in ethmoidal disease, are capable of producing asthmatic attacks. It has been shown experimentally on animals that if the posterior portion of the nose be stimulated, the lungs become dilated and rigid. If, on the other hand, the same mucous membrane be cocainised, this condition in the lungs disappears. As a general rule, the observation holds good in children that asthma is usually preceded by bronchitis, which in turn, is generally preceded by acute rhinitis. As a result of the progress of the catarrhal infection, a spasm of the bronchial muscle takes place, followed by the perverse type of breathing.

Attention has also been called in recent publications to the possible relation of asthma to rachitis of the nose. As yet nothing definite is known about this condition. By observation of the noses of rachitic children, it has been pointed out that the condition occurs at the point where the cartilege and the small bones of the nose come in contact. In the rachitic nose, the small bones undergo the same changes and show nodes similar to those which are observed in the ribs. They may also show a condition of subluxation. In nasal rickets, moreover, the mucous membrane presents a chronic cell infiltration.

It is reported by careful observers that nasal rickets is often complicated by bronchial asthma. The reflex neurosis producing the asthma may originate from any part of the mucous membrane, but particularly in the hyperemic area covering the rachitic nasal bone. It may be remarked incidentally that the nasal changes of rickets may be very pronounced when other manifestations are minimal or poorly developed, or when all other signs are wanting.

Walb (Rachitis of the Nose and its Relation to Asthma. *Deutsche Med. Wochenshcr.,* 1913) relates a typical case. A girl of eight years came to him with diffuse bronchitis, dyspnœa, and definite symptoms

of asthma. In the mucous membrane of the nose and nasal pharynx, a chronic catarrhal inflammation was found. The nasal bones were deformed; the tonsils were hypertrophied; the teeth were markedly rachitic; and slight scoliosis was present. There were also large adenoid vegetations. After the removal of the adenoids and tonsils, the asthma still continued. In view of the suspicion of the rachitic condition of the nasal bones, the child was placed on an appropriate diet, and phoshorus and cod liver oil were administered. She made a recovery.

Walb mentions two other children of the same family who were both suffering from asthma of several years' standing. Both were markedly rachitic. Under appropriate anti-rachitic treatment, the rickets improved, and the asthmatic symptoms disappeared.

We may also, in this connection, refer to Kassowitz, who up to the present day, has been the foremost student of rickets. He considers that asthma is in some way or another a complication of rickets, though he makes no reference to the nasal origin. He records a case of a markedly rachitic child fourteen months of age who presented loud bronchial râles and marked dyspnœa. Under treatment with phosphorus and cod liver oil, the patient promptly recovered, not only from the rickets, but from the asthma as well.

Other Diseases in Which Symptoms of Asthma Are Present.

Enlarged bronchial glands may give rise to severe dyspnœa, which may simulate bronchial asthma. In young infants an enlarged thymus may cause a varying degree of dyspnœa, which may also suggest an attack of bronchial asthma. In the more severe cases of thymus compression, there are symptoms of tracheal stenosis with retraction of the epigastrium and the upper portion of the sternum. Cyanosis is a common symptom. The enlarged thymus can be demonstrated by a physical examination and by the X-ray.

Asthma of cardiac and renal origin requires no special consideration at this point.

Symptomatology.

Asthma may occur in children at almost any age. Clinically we may recognize two main varieties, first, those cases which are associated with bronchitis; and, secondly, those which are characterized by sudden onset, usually accompanied by pulmonary emphysema, and in which there is a tendency to periodic recurrences. In the first form the disease begins with marked bronchitis, fever, lassitude, rhinitis, restlessness, and even delirium. Anorexia and vomiting may occur. Frequent and disturbing cough with dyspnœa are the early symptoms.

Fever may reach a considerable degree, and the pulse is frequent. The dyspnœa, however, is the most characteristic symptom. Respirations may be fifty to eighty, and even higher, per minute.

The dyspnœa is usually expiratory in character. The breathing is loud and noisy. The inspiration in most cases seems somewhat freer and less obstructed than the expiration, which is longer and whistling. If one inspects the thorax, he is struck by the immobile appearance of the chest during expiration, a condition resembling the emphysema of adults. The cough is usually persistent and disturbing; the breathing continues noisy. One has the feeling that there is considerable secretion. The younger children, however, do not expectorate. If the patients vomit, mucus from the bronchi may be seen in the vomited material. If the chest is examined, one hears numerous dry, whistling, sibilant râles. Sometimes percussion reveals an emphysematous character of the lungs. In infants, the possibility of capillary bronchitis should be considered.

The following case illustrated the condition as described above: A. C., male child, age eight months, was admitted to the hospital because of dyspnœa, cough, fever, and prostration. About four days before the mother noted that the respirations became rapid and jerky, and that the child had great difficulty in breathing. At times he became cyanotic. The respiration was wheezy in character, so that it could be heard at a considerable distance. The infant had been coughing for two weeks, during which time the cough had been non-productive, though the condition had become more severe during the past forty-eight hours. For four days the little fellow was greatly prostrated. He lay in bed breathing very rapidly, crying feebly and refusing food. He seemed more comfortable when propped up on pillows. The mother informed us that he had had an attack similar to this four weeks previously; that he had since birth been frequently subject to colds; although he had never suffered from any definite illness. His respirations were 72 per minute; pulse 160; fever 102.6°. The blood examination, among other things, showed 18,000 leucocytes, with seventy-eight polymorphonuclears. The examination was negative, except for his lungs, which showed normal boundaries and were somewhat hyperresonant. Upon auscultation, one could hear over the entire chest, every variety of dry râle, which were loud and penetrating and seemed almost constantly present. The patient was given 1/1,000 gr. of atropin and 1/50 gr. of codein every three hours for four doses; was fed breast milk and orange and a small quantity of cereal. In two days the temperature became normal, the cough abated, and in a few days the patient had made a complete recovery.

Another patient, T. O., five years old, female, came for examination because during the past year she had had frequent attacks of bronchitis accompanied by dyspnœa. These attacks recur every week or two. The manifestations are typical asthmatic spells. The dyspnœa is severe and continues the entire night. There is no definite relation between the attack and the ingestion of any particular kind of food. Her temperature is 98.8°. She weighs forty-one and one-quarter pounds. Examination of the urine shows a trace of albumin and ten to twelve pus cells per field, with an occasional clump of pus cells. The blood shows 18,000 leucocytes, of which thirty-eight are lymphocytes, two large mononuclear cells, forty-seven neutrophiles, and thirteen eosinophiles. On examination, she presents a dusky appearance. Her thorax is slightly emphysematous; and on auscultation, one hears numerous whistling, sibilant râles.

Another child, male, aged nine years, was admitted to the hospital because of recurrent attacks of coughing. These spells occur every winter, at intervals of about a month, and last from twenty-four to forty-eight hours. They are more frequent at night than during the day. During an attack the child coughs frequently, complains of pain in the epigastrium, becomes markedly dyspnœic, is unable to lie in the recumbent position, and is more comfortable when propped up in bed. The anorexia is almost complete. His temperature is 101.6°; pulse, 124; respirations, 40. The parents maintain that all these symptoms have been present since the child was four weeks old.

The examination shows that the patient has a barrel-shapped chest; the breathing is laboured; the chest is in the inspiratory position; the respiratory excursions are very limited and hurried. The breathing is harsh, with numerous dry râles. The respirations are wheezing in character. The father has had recurrent asthma for years. The blood examination shows 9,900 leucocytes, eighty neutrophiles, sixteen small mononuclears, three large mononuclears, one eosinophil. The von Pirquet test is negative.

The second type of asthma, as it occurs in children resembles in many respects the asthma of adults. The attacks tend to be recurrent, and present themselves with every degree of severity. In many of the patients there is a definite neuropathic history in the family. Many of them are particularly susceptible to changes of weather. Some are attacked mostly in the winter; some have their attacks in the summer, associated with hay fever. In some instances the asthma bears a striking relation to eczema, thus presenting the condition which has been described by Czerny as exudative diathesis. Others are susceptible to certain kinds of foods, proteins, etc.

As a rule, children who have apparently been in normal health

are suddenly attacked with severe dyspnœa shortly after retiring. There is little or no cough; the breathing is rapid. The dyspnœa may be intense. The chief trouble is expiratory, the chest being in position of full inspiration, and strenuous efforts are made by the expiratory muscles to empty it of air. It severe cases there may be marked orthopnea. Cyanosis of varying degrees of severity is usually present. Fever is usually absent. The symptoms, in most instances, may be explained on the basis of obstructed breathing in the bronchi, interference with pulmonary circulation, and accompanying emphysema. In recurrent and chronic cases, the facial appearance is suggestive. There is a tinge of cyanosis about the face, particularly the lips, and a dilatation of the small veins of the cheek and conjunctiva. The hands are cool; the pulse is rapid, often tumultuous or small. Sometimes the patient has involuntary passage of fæces or urine. The alæ nasi become large on inspiration. The sternal notch and the epigastrium are retracted, and all of the accessory muscles are in lively activity. On percussion, the lungs are hyperresonant, and the normal excursion is diminished. On auscultation, loud, whistling and sibilant râles are heard, which almost obscure the normal respiratory tones.

The expectoration contains Kurschmann's spirals, Charcot-Leyden crystals, and eosinophile cells. The attack lasts for a variable time, from a few minutes to hours or days, usually disappearing as suddenly as it came. Some children may be perfectly normal between the asthmatic attacks. Sometimes, even though the attack disappears, a bronchitis continues. There are some children, who, between attacks, continue pale, show a degree of lassitude, and are irritable. As a rule, the attacks tend to disappear in later childhood, though sometimes they continue late into adult life.

Our records contain numerous cases of asthma in children of all ages. Some of them are attacked only during the hay fever season, and are relieved by change of climate. Some are susceptible to one or another kind of protein food; some to animal emanations; and in some the condition is chronic and occurs apparently after slight colds, attacks of indigestion, nervous excitement, or without reference to any definite exciting cause.

An interesting case is that of J. M., female, aged four years eleven months. She was delivered by cæsarian section, the mother dying three days after the birth of the child. The patient has been artificially fed ever since she was born. Since she was seven months old, she has had eczema, which disappears and returns at varying intervals. Asthmatic attacks began when she was about twelve months old. At first, they recurred at long intervals, but after the baby was two years

old, the periods became shorter and the attacks more severe. At three years of age, the child acquired whooping cough. The combination of asthma and whooping cough caused intense suffering, and produced attacks of great violence, marked by dyspnœa, cyanosis, and respiratory distress. The child became greatly exhausted. She was unable to recline in bed and had to be supported, in the sitting position, in the arms of a nurse most of the day and night. The dyspnœa and the discomfort continued almost without interruption. The heart became markedly dilated; the pulse weak and rapid; the cyanosis increased; and numerous râles were heard over the lungs, though the heart tones remained clear. This combined paroxysm of whooping cough and asthma lasted for days at a time. The cough itself persisted for weeks, during which time there was an occasional abatement of the asthmatic manifestations. The child ultimately recovered from the whooping cough. The dry broken eczema on the skin, however, persisted, and the asthma itself after intervals of several days' absence, would recur, lasting usually for about two or three days at a time. The patient obtained great relief by a prolonged visit to New Mexico, though the asthma recurred upon her return to Chicago.

The examination shows the child with dry skin, broken here and there by fresh eczema patches and a slightly bluish discoloration of the visible mucous membranes. The tongue shows map-like configurations on the surface, presenting the condition known as lingua geographica. Examination of the thorax shows some involvement of the accessory muscles of respiration, even during quiet breathing. The urine shows no pathological findings. The blood shows 85% hæmoglobin, 16,200 leucocytes, forty lymphocytes, four large mononuclears, forty-seven neutrophiles, two transitional, seven eosinophiles. Percussion elicits a hyperresonant note. The respiratory excursion is diminished, and the lung tissue overlies the normal cardiac area. The lungs are emphysematous. Auscultation gives evidence of a moderate degree of chronic bronchitis, even during the quiescent periods. During an asthmatic attack, the sibilant and whistling râles predominate over every other sound.

The food was changed and adapted in every conceivable manner without affecting in the least the course of the disease. During a severe paroxysm, drugs exerted, for the most part, little or no influence. The greatest relief was obtained temporarily by 1/20 or 1/30 gr. of morphine hypodermatically. The case also represents the clinical findings which are described under the caption of exudative diathesis.

Another case is that of a boy who was brought to me when eight

months old with severe eczema on cheeks, forehead, and wrists, which itched intolerably, so that he was awake and restless night and day. He was having one quart of milk daily. This was reduced in quantity, and cereals and broths were substituted. In consequence, the eczema improved, so that the itching disappeared.

At eleven months of age, asthma appeared and has persisted up to the present. The attacks occur most frequently in winter, seldom in summer. They come on after an acute cold, though the mother observes that they will also occur after indigestion or great fatigue. They are very severe in nature, and last for two or three days at a time. The patient has marked idiosyncracy against egg. Even the slightest trace of it in his food will bring on an attack. He is now seven years old; the attacks continue, though they occur at long intervals. He is under-sized, of insufficient weight, eats poorly, and is still sensitive to egg.

My colleague, Dr. J. H. Hess, furnishes me with a brief reference to a very interesting case of food asthma in a boy eight years of age, the son of a physician. The boy was subject to recurrent attacks of asthma, of which the father was unable to ascertain the ætiologic factor. They usually came on during the early evening, increasing in severity during the night, and lasted for about six or eight hours, after which the little fellow became perfectly normal.

In endeavouring to ascertain the causal factor, the feeding history was carefully investigated. It developed during the enquiry that the father himself disliked pork, so that it was never served while he was at home. The grandmother, however, confessed that whenever professional engagements necessitated the father's absence from home, the mother usually indulged in a pork debauch. The grandmother noted that the boy was seized with violent asthma after every one of these pork meals, and consequently suspected that this food had something to do with bringing on the attacks. Two weeks after the attack mentioned, the boy was given a roast pork dinner as a test meal. During the ensuing night, he was again seized with a violent attack similar to the preceding one, thus proving without doubt his sensitivity to this meat. Naturally, it has been omitted from the diet, and in consequence, he has had no further attacks.

Prognosis.

As has already been indicated, many of these children tend to recover before puberty. In some, the condition, however, persists into adult life. The prognosis depends largely upon the permanence of the emphysema. If the attacks are of infrequent occurrence, and the emphysema is slight, the prognosis is favourable. When, on the

other hand, the attacks are of frequent occurrence, and the emphysema becomes extensive and firmly established, a chronic bronchitis occurs. The patients show more or less continual cyanosis and a persistent dyspnœa. They are in permanent ill-health and are likely to succumb to pulmonary or cardiac complications. It should be emphasized again, however, that these are exceptional cases. The great majority which have come under our observation tend to recover permanently. The attacks, however, may be replaced by other nervous manifestations in later life, the most common of which is migraine.

The differential diagnosis of asthma must be made from congenital stridor, thymic asthma, pseudo-croup, diptheria, laryngitis of measles, whooping cough, retropharyngeal abscess, enlarged bronchial glands, and foreign bodies in the larynx.

Treatment.

Prophylaxis. The treatment of asthma in children calls for a most careful physical examination. The presence or absence of rickets, spasmophilia, disease of nose or throat, the presence of eczema, neuropathic taint, or inherited disposition to the disease—all may have importance in treatment.

In 1907, Besredka stated that calcium chloride has the power to prevent spasmophilia. Since then this discovery has been confirmed experimentally by others, and has proved effective in preventing the occurrence of attacks. It is used in cases of spasmophilia in infants and in children of every age. It may be given for a long time with occasional intermissions of a week or two. Young infants of a year or less may be given three to five grains in watery solution, four times daily.

In older children, respiratory exercises are of value in connection with other hygienic measures, such as bathing, cool sponging, and a life out of doors. Patients should eat carefully, and provide for daily evacuation of the bowels. They should be spared nervous overstrain, both at home and at school.

For the hay fever patients, relief is frequently obtained, and tolerance increased, by injecting pollen extracts derived from the special exciting plants. Goodale directs that the pollen be either placed in solution for extraction or preserved dry for an indefinite period. A suitable extract constitutes a stock solution from which subsequent dilutions may be made. In order to determine the strength of the solution to be used for injection, a skin test should be made. It should be stated, however, that in children under ten

years of age who present well defined symptoms of hay fever, no skin reaction with the prevailing pollen will take place.

When possible, however, the special exciting pollen should be determined by the skin test. The initial dose of the injection should not exceed five to ten drops of the aqueous extract of the pollen. The dose may be gradually increased drop by drop thereafter. Injections should be made at intervals of two days to a week, and should, in most cases, be stopped before the date of attack, since the introduction of protein may cause an increase of symptoms at this time.

In cases where asthma occurs suddenly during hay fever, removal to the mountains or to northern resorts gives prompt relief, and is to be advised wherever possible.

The local treatment of the nasal mucous membrane should be undertaken in every case where a pathological condition exists. A normal nasal mucous membrane is less likely to absorb the specific protein than a diseased one. For this reason, nasal polyps (chronic ethmoiditis), should receive prompt and appropriate attention, preferably by a specialist.

Treatment of the Attack.

Adrenolin in one to two drop doses of a 1/1000 solution frequently checks the attack. At times, injection of morphine in doses of 1/20 to 1/50 gr., combined with 1/1000 gr. of atropin is required to control the paroxysm. Talbot has also suggested that in order to build up immunity against sensitizing proteins, children who show anaphylactic reaction to egg albumin, should be given minute doses of this protein, preferably in capsules, increasing the dose until the patient is immunized.

Treatment by the use of autogenous vaccines has also been recommended. Where there is secretion from trachea or bronchi, the organisms are obtained by aspirating the secretion, isolating the organisms, and preparing the vaccine from this aspirated material. Although I have seen this method tried, I have never been convinced of its efficacy. During the attack I have frequently seen temporary relief afforded by burning nitrate and stramonium papers. If everything else fails, the little patients receive the greatest benefit by a change of climate. I have frequently seen children, for whom life during our northern winter was intolerable, improve almost at once if removed to Arizona or New Mexico. Sometimes relief is obtained for these patients in Florida or California, though experience in each individual case determines the best locality. The hay fever patients are relieved by removal to northern or mountainous regions, occasionally by a sea voyage or by dwelling at the sea coast.

PRACTICAL INFANT FEEDING FOR THE GENERAL PRACTITIONER

DOUGLAS ARNOLD, M.D., BUFFALO

It is impossible to speak on the subject of practical infant feeding without at least referring to the most practical of all infant feeding and that is, breast-feeding. If there is one trust that we more often violate than any other, it is the neglect of exerting every effort in keeping the new-born child on the most perfect and most highly tolerated of all infant foods—mother's milk. It is a fact that most mothers, with proper technic, can nurse their infants. It is also true that it is very easy to discontinue for insufficient reasons. I think I have seen my share of new-born children and know what unruly citizens they sometimes make, how they can with their squalling upset a whole household and drive the poor doctor to order up anything to drink.

We must also remember that bad-looking stools are the rule, and not the exception, in young breast-fed infants, and do not denote a poor milk supply. There is one type, however, of which we must be careful—it is the premature or weak infant with insufficient strength to stimulate the breasts—these children cannot stand starvation, and this is often the way they meet their end. Of great importance is *allaitement mixte,* or mixed feeding, which, when properly used, may make possible at least a partial breast-feeding.

With this short plea for breast-feeding, I will now approach the subject of artificial-feeding.

There is no other subject in medicine which has made greater strides than infant feeding; the text-books and teaching have, as a rule, not held the pace and so we can hear or read almost anything. This resulting maze has discouraged us and made us easy prey for patent food advertisers and "follow-the-directions-on-the-can" advice, which is just as disastrous as allowing a layman to open the abdomen, first, of course, having read the directions.

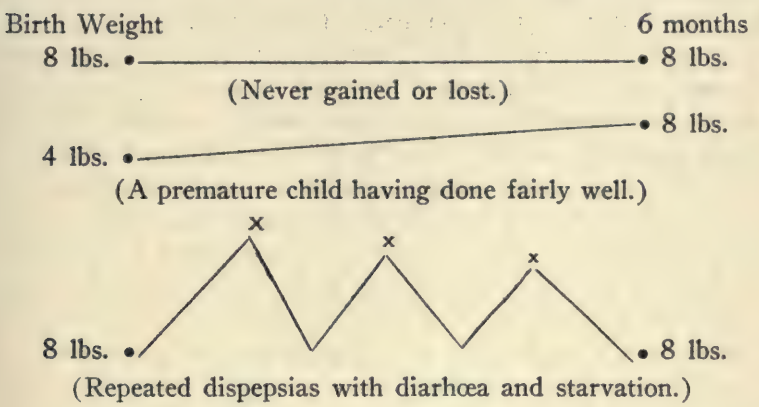
So infant feeding has resolved itself into following simple basic principles. We no longer feed percentages; we speak in percentages for convenience; we no longer feed according to calories, we check ourselves up to see if we are grossly overfeeding or underfeeding; but we feed according to tolerance. What is tolerance? Tolerance is the ability of an organism to take care of food or the reaction of an organism to food. A high ability means a wide tolerance; a low

ability a narrow tolerance. Normally, there is a wide tolerance which accounts for some so-called good results, which infers that the results were in spite of, rather than due to, the feeding. Some seem to have a very wide tolerance, the so-called "carpet-tack" children. They seem to thrive in spite of us. I say they seem to thrive; look them over carefully, remembering there is that word morbidity as well as mortality.

Tolerance is not a fixed element, but subject to changes. Any injury lowers or narrows tolerance, overfeeding, underfeeding, hunger. Infection (enteral or parenteral) also lower tolerance just as it does the sugar tolerance in the diabetic patient.

How is tolerance estimated? By the history and the physical examination. The nutritional history is very important. Was the child a full-term child? Birth weight? Its place in the family, with history of miscarriages, still-births or prematurity. Is there any tuberculosis contact? Was the child nursed? How long? If not why not? Different foods used, number of feedings, quantities. In general, what was the dominant reason for changing; diarrhœas, vomiting, non-thriving or infections.

The following charts show graphically the importance of history:



(Repeated dispepsias with diarhœa and starvation.)

To gross enquiry these three children at six months appear about the same, and yet how differently they must be treated.

The physical examination naturally must rule out syphilis and tuberculosis, for no child can gracefully carry around these conditions. Note the general appearance, the colour, posture, turgour, skin, musculature (whether hypotonic or hypertonic), and the bones.

Now that we have formed an estimate of the child's tolerance, the

more careful we have been the less liable are we to be disagreeably surprised by the child's reaction to our first formula, or the reaction to food intake, which is the final index or proof of tolerance.

Now, in this connection I must say a few words about food withdrawal, or hunger. I prefer to call it starvation, either qualitative (proprietary foods or continued barley following diarrhœa) or quantitative. Starvation is a very potent therapy. It can cure in diarrhœas, if given correctly, or can kill, if used unwisely. This is a fine point, and requires the best of judgment. It may be indicated to starve a child, but because of collapse, you may be obliged to feed and stimulate. You can kill a child with decomposition by a six-hour starvation. Starvation, therefore, is not a therapeutic agent to be used indiscriminately.

The prognosis can be given when the tolerance is estimated. If the child has reached a poor condition in spite of good treatment, the prognosis is bad. Always give a prognosis with the infection proviso; the parenteral infections are to be thought of in this connection, and especially is this true of the respiratory infections. Of great importance in this connection is the subject of hospital isolation (cubicals) and the so-called family "cold" in the home.

Initial cathartics are not cure-alls and should be used with great care. They may start a complicating fatal diarrhœa.

Now what shall we feed? Certainly not the proprietary foods, which are high in carbohydrate and low in protein, giving a child which is water-logged with poorly-bound water no relief. The child may look good, but, as the saying goes, we never know how we are made until we are tried. With an infection or diarrhœa there is a loss of the loosely-bound water with consequent great loss in weight. Use a balanced food, one in which the elements are in proper proportion. Bear in mind that the protein and calcium salts tend toward alkalinity and putrefaction with resulting constipation, and that carbohydrates and sodium salts tend toward acidity fermentation and diarrhœa. Fats take a medium place in this respect. High fat is unnecessary, and liable to cause trouble, especially vomiting.

Lime water is no good unless used in 50% of the quantity of the formula. Use a simple whole-milk dilution, with a carbohydrate addition. This will hit about 99% of cases. In a general way:

One-third milk the first month,
One-half milk the second to third month,
Two-thirds milk the sixth month,
Whole milk the tenth to twelfth month.

The following are the sugars used in order of their fermentability and are to be used from 1% to 7%, depending on the stools, weight, mixture, etc.:

Disaccharid	Malt Sugar	Most fermentable is stimulating to the gastric mucous membrane, and must be used with care in vomiters.
	Lactose	
	Cane	
Polysugar	Dextrin-maltose mixtures.	
Polysaccharid	The second carbohydrate least fermentable starch (gruels, flour).	

Start with about three oz. per pound quantity for the twenty-four hour period, and figure the twenty-four hour quantity rather than the single feedings, for, after all, that is what we are estimating, and, besides, it lends itself to a more gradual increase. Feed every three hours or every four hours, depending on the ability of the child to take the proper amount in the twenty-four hours. Follow as a biologic reaction, increasing *either* qualtitatively *or* quantitatively, depending on the results obtained (one oz. at a time), always keeping to a minimal feeding, or the lowest amount on which the child gains normally and shows the other signs of health. Then you will not be feeding up to the upper limit of tolerance and flirting with Providence. In other words, do not disturb a child that is doing well. When feeding within the limits of tolerance we get a so-called normal reaction, or increased weight to increased food. If the tolerance is overstepped we get a paradoxical reaction, or to increased food we get a drop in weight and an upset.

The nutritional results are gauged by—

(1) Weight-increase on a balanced food. This should be gradual and not fluctuating.

(2) Stools. Much information can be gleaned from the stools. Thank Heaven for a constipated baby.

(3) Vomiting (types).

(4) Appetite. An anorexia often presages an upset.

(5) Turgour. Is the child firm or flabby? This tells oceans concerning its water-binding (stability) and immunity.

(6) Colour. Child should have a rosy, healthy colour, and not the grey appearance which denotes a water loss.

(7) Much can be told by examination of the skeletal system (bones and dentition).

(8) Immunity. A healthy child should be able to withstand infection, or at least tend to throw off infection. This is one great asset of the breast-fed child.

(9) Disposition. Sleep, crying, etc. I put this last because there is a great variation in disposition in otherwise normal babies, for which we, as doctors, cannot be held accountable.

At first a gain may be qualitative (not weighable). The child looks better and, after a variable period, starts to gain in weight. This is called the reparation period. It is important that we recognise this. Then we will not be inclined to get restless and push the child too hard, and, possibly, over its nutritional tolerance, with a resulting paradoxical reaction. For the same reason we should recognise the period spoken of as the initial impairment, or the loss frequently met with when a child is changed from a high salt, high carbohydrate food, with consequent weight loss.

If we follow these general ideas we finally will be subconsciously estimating the tolerance of our patients. We will realise that some children cause us no anxiety, while others require our best nutritional judgment to supply the child's need and keep within its narrow limits of tolerance.

THE EDUCATION OF THE MEDICAL STUDENT IN HIS RELATION TO CHILD WELFARE

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Any comprehensive scheme for child welfare which is destined to yield fruitful results must first seriously consider a broad educational programme. Three main lines of effort need to be carefully planned, and carried out with an enthusiasm which brooks no discouragement. Of primary importance is the education of the mothers, and prospective mothers, in modern infant and child hygiene. This has already been attempted in many places by various means. Consultation of the mothers with physicians and nurses in infant welfare centres, and follow-up in the homes by the nurses, has been the most effective method of approach. Educational literature and popular talks before mother's clubs and school associations have supplemented the direct teaching in the centres and homes. The most logical place, however, to begin instruction is in the public schools. Every girl who comes into our schools may be looked upon as a potential mother, and should, therefore, be gradually introduced, while still in the most impressionable age, to infant hygiene and domestic economy. Voluntary societies—"Little Mothers' Leagues"—have met the need in some places, but the tendency in all such voluntary associations is for the interest to lag and instruction to become too desultory. Where well coördinated courses in infant hygiene have been introduced into the seventh and eighth grades of the public schools they have met with enthusiastic response on the part of the pupils, and have paved the way for more intensive instruction later.

The community at large should have constantly kept before it the ideals and purposes of child welfare work. If presented in the proper manner it is usually easy to stimulate community interest. The community may be educated to the immediate needs for infants and older children by means of newspaper articles, magazines, pamphlets, posters, exhibits and motion pictures, as well as by lectures. The child welfare organizations working in any community should coöperate in a definite manner in the publicity which they attempt. In the larger cities, bureaus of health education, with a wide-awake publicity man, as an intergral part of the department of health, will be in a position to give the community better service than any one organ-

ization. *It is the continuous, daily effort in presenting various phases of child welfare to the public which far outweighs the sporadic outburst of individual agencies.*

The third line of education is perhaps the most important, at least so far as the preservation of our ideals and the development of infant welfare work is concerned. It, therefore, cannot be too strongly emphasised that the physicians of the community also need to be educated (we might say re-educated) in modern socio-medical problems affecting the welfare of children. This work in a community can never be elevated to a higher level of skill and devotion than the medical and nursing professions raise it. In order to carry on the most effective service for children special preparation on the part of physicians and nurses is absolutely essential. For the physician, the beginning of this training should hark back to the medical course, where ample opportunities are afforded for education in the fundamentals of infant and child welfare. In a few medical schools this has already been done, and the results of the readjustment are already manifesting themselves in the communities where the young practioners have settled. Where educational facilities are not thus afforded, the general medical training must be supplemented by post-graduate courses; by actual work in infants' clinics, and by a text-book study of the best methods of infant feeding and hygiene. It is the purpose of this paper to briefly outline the minimum requirements for the education of our medical students in child welfare work.

We must recognise at the outset that special work for children, either along social or medical lines, has been of relatively recent development. For centuries the care of the child was simply incidental to other work in the family. Fetishes, superstitions and the advice of grandmothers made up in large measure the treatment of the sick child. As medicine gradually evolved out of magic and alchemy the child was treated as a part of general medical practice. Private practitioners and midwives did a large part of the obstetrical work in the community and the medical man was usually "tried out on the baby" before being admitted to the sacred precincts of "family physician." This intimate and personal relationship between physician and family led the physician to view his practice in a very individualistic way. If the baby was taken ill and a physician called to attend it he was very apt to closely circumscribe his relation to the *family* of which the baby was an integral part. The idea of responsibility to the community for the welfare of the baby has been of rather recent growth. The introduction of public health service, with the growth of public health nursing, met at first with considerable resentment among many physicians who felt that their "private practice"

was being interferred with. It is not necessary to review here the gradual steps which have led the private practitioner out of his individualistic groove to a consideration of community problems. It is sufficient to state that we now view the baby in its larger sphere as being raised for the good of the community. The family have simply been entrusted with the nurture and care of the child during its tender years in order to bring it to a position where it is an asset to the community. The changed attitude of the medical man towards the care of children was very well expressed in a paper read at the last meeting of the American Association for the Study and Prevention of Infant Mortality. Dr. Lippman asked the question, "Is the pædiatrician only a practicing physician, only a teacher of his speciality?" and answered it as follows, "Most assuredly he is first and foremost a member of the body politic, a member of the community, a citizen of the country, and as such *it is his duty to exert all the influence that is at his command in the interest of the welfare of his community and in a larger sense of his country.*"

We must acknowledge that considerable skill in the treatment of children's diseases was often displayed by our medical forebears. But their efforts were largely limited by empirical methods. The experimental era in medicine ushered in a new day. With the development of modern physiology, pathology and pharmacology it was seen that infants and young children should be considered not as "little men" and "little women," but as distinct entities to be treated by special methods. The problems connected with infancy and childhood opened up a very fruitful field for research. Studies in infant metabolism and the physiology of digestion paved the way for more rational methods of infant feeding. It became evident that if more babies were to be saved special attention must be given to infant hygiene. The idea of prevention loomed large on our horizon. There had been a widespread neglect of the slight departure from normal in babies. Both physicians and parents were prone to minimise the importance of mild gastro-intestinal disorders. As Grulee remarks, "The tendency to disregard light gastro-intestinal symptoms is so widespread that one feels helpless in endeavouring to caution even the profession in this regard, but the recognition and proper treatment of slight gastro-intestinal disturbances is of much more importance than the ability to treat more severe conditions when they arise."

Up to within recent times very little definite instruction was given in our medical schools to meet the pressing needs of infancy. Such as was given appeared in courses in internal medicine or obstetrics. The instruction was often scattered and not linked up to clinical demonstra-

tion. Little, if any, opportunity was given to students to carry out the details of infant feeding in their dispensary work. Gradually, however, it was recognized that the problems of infancy and childhood were sufficiently intricate and apart to merit special instruction. Here and there arose medical men of broad training who specialized in children's diseases and infant feeding. In the United States the first special clinic for instruction in the diseases of childhood was established in 1860, at the New York Medical College. It was some years, however, before pædiatrics as such was recognized as a special subject demanding the entire attention of the instructor. To-day there is scarcely a medical school of note which does not have a separate chair of Pædiatrics.

The number of physicians devoting themselves exclusively to pædiatrics is comparatively small. Much of the work is still done by obstetricians and general practitioners, but there is a growing tendency for them to refer the more difficult cases, especially of feeding, to men trained in pediatrics. We must still recognise that the general practitioner is the first approach to the family. Considerable responsibility rests with him for the welfare of the child in his determining whether he is fully enough equipped to handle the case, or whether he should refer it to a physician specially trained. More than mere medical treatment is needed for the welfare of many of the children coming to our attention. The socio-medical aspects of child welfare should, therefore, be presented to medical students as well as to practicing physicians. If we are going to do the best possible for the children of our community, there must be the closest understanding and coöperation between obstetrician, pædiatrist and general practitioner. Each bears certain responsibilities to the public health service of the community.

There has been in many places an undercurrent of feeling that the public health authorities are antagonistic to the private practitioner; that they are trying to undermine and supplant his work. It is true in a large sense that all of us are working for the prevention of disease, and the establishment of more hygienic modes of living, and this in itself will eliminate some of our work for the sick.

In all forms of public health service where the physicians have coöperated with health authorities it has not only reflected credit upon the profession, but has established relations advantageous to the physicians themselves. The opposition which we met from a number of medical men ten years or more ago in regard to infant welfare work is gradually disappearing, and in its place a keener interest in child welfare problems has come. The private physician, for his own good,

should familiarise himself with the work of all child welfare organisations in the community and especially with the work for children of the local department of health. This interest is more actively stimulated in those who have had the advantage of training in child welfare methods during their medical course.

Can we adapt our present medical educational scheme to the needs for more training in infant and child welfare work? Most certainly we can, and, furthermore, some of the medical colleges have already worked out practical programmes which lead the student to an intelligent appreciation of such work. An ideal scheme for the education of medical students in the essentials of infant and child welfare would include instruction in the following:

1. The clear understanding of the structure of modern society, with special emphasis upon the changes which are taking place in medicine from an individualistic to a community service.

2. Familiarity with the general methods of all social agencies working for the welfare of the child.

3. A knowledge of the causes of infant mortality, and the most approved methods of prevention.

4. A good working knowledge of obstetrics especially in its relation to the nursing and social needs of the community.

5. Experience in maternity (prenatal) service.

6. A course in pædiatrics, laying special stress upon the fundamentals in infant hygiene and infant feeding.

7. Thorough instruction in modern pædiatric methods, with actual experience in a babies' dispensary and in an infant welfare centre for prophylactic work.

The foundation for infant and child welfare work should really be laid in pre-medical courses. Well-planned courses in sociology and economics give the student a breadth of vision which proves invaluable in his understanding of the socio-economic problems connected with child life. For the best work in child welfare it is essential that the student gain a comprehensive grasp of the organisation of modern society and understand the various functions of the agencies which have grown up to meet the needs of child life. A clear understanding of the relation which private philanthropies bear to the public health service for children should be obtained. The inevitable tendency of the community, through its public health authorities, to regulate or control all organisations dealing with babies and older children must be pointed out. No education is complete in these eventful times without instruction in the development of democratic ideals with the added personal responsibilities which they impose.

The limitations which a rampant individualism places upon the community protection of child life needs to be very clearly understood. The student must be in a position to be able to sift out for himself the chaff from the wheat in our modern socialistic tendencies. In other words our plea is for a breadth of education in pre-medical courses.

Our medical courses themselves have been so crowded, and the demands upon the students' time for the so-called "essentials" so great, that the tendency has been to push aside definite instruction in child welfare. The clinical side has received somewhat more consideration, but only within recent times has it begun to get the attention it merits. A great deal, however, might be done from the very first of the medical course to stimulate the student's interest in child life without seriously interfering with the "fundamental courses." In fact within these courses themselves ample opportunity offers itself to impress the student with the differences which exist in infant anatomy, pathology and physiology as distinguished from adult conditions.

Definite instruction in the disorders of childhood, and their relation to child welfare work, will necessarily come in the last two years of the medical course. During the third year it is desirable to offer a comprehensive course in preventive medicine and hygiene. This will be made up of lectures, demonstrations and field work. Each student should be held responsible for the investigation of some problem in preventive medicine bearing upon child hygiene which he should report to the class. Special attention will be given to epidemiology and the prevention of the communicable diseases of childhood. A certain amount of statistical study should be carried out to familiarise the student with the value of exact birth and death records, the estimation of infant mortality rates, the various checks employed to estimate the completeness of birth registration, etc. Students should be given the opportunity to take observational trips to the principal public health activities in the community. They could study to advantage the water supply, milk production and distribution, methods of commercial pasteurisation, housing, sewage disposal, fly prevention, and the local tuberculosis situation.

The time has fully come when every well-regulated medical college should have a separate department of pædiatrics, with a full-time professor and a staff of assistants, who are competent to present the various sides of child welfare to the students. Pædiatrics is a branch of medicine which has special problems to solve, and it has developed methods of investigation which deserve consideration. It, of course,

touches many other branches of medicine, but has more direct relation to the science of obstetrics. The lines of cleavage between obstetrics and pædiatrics are becoming more clearly defined. While the closest possible coöperation must be maintained, it is coming to be accepted that the baby be turned over to the pædiatrist as soon as the cord is tied. In some of our best medical colleges the routine is now established in having every baby turned over immediately to a nursery ward under the direction of the professor of pædiatrics.

The work of the pædiatric department is preferably arranged for in the third or fourth years of the course. During the third year at least two, and perferably three, full hours a week of instruction should be provided in didactic and clinical work. This is intended to give the fundamentals in the diseases of infancy and childhood, including communicable diseases. Whenever possible, the points brought out in lectures should be illustrated by typical cases in a babies' dispensary or hospital. Stress should be laid upon the nutritional disorders of infancy and the principles of infant feeding.

In the fourth year the work in pediatrics and child welfare must be made more intensive, and concentrate upon a programme for socio-medical work for children. A very satisfactory course has been included in the schedule of the Western Reserve University School of Medicine, at Cleveland, which seems to meet most of the requirements in the education of the medical student in child welfare work. Experience has shown that this course can be worked out satisfactorily, and that the medical students go out with a sympathetic appreciation of child welfare. It may not be out of place here to simply quote from the recent Bulletin of the medical school the work outlined for the fourth year medical students:

"The pediatric work in the senior year, just as in the junior year, includes contagious diseases. Accordingly the student spends two months in pædiatric work. During one of these months, however, the contagious work is emphasised, and during the other month the other pædiatric work.

"During the month of concentration on the study of contagious diseases, the student is a clinical clerk in the contagious wards of City Hospital during the forenoon; and during the afternoon, except for scheduled lectures and elective courses, a clinical clerk at the central dispensary of the Babies' Dispensary and Hospital.

"During the month of concentration in other pædiatric work the student spends two whole forenoons, a part of three forenoons, and the end of each afternoon in the children's ward of Lakeside Hospital, where he examines, observes, and theoretically treats patients that are

assigned to him. On two forenoons of each week for four consecutive weeks, each student spends a session of two hours as assistant to one of the demonstrators in charge of a prophylactic babies' dispensary. Here he has opportunity to acquaint himself with the natural and artificial feeding of normal infants and with the anatomy and physiology of a normal child. Finally, one whole forenoon is devoted to practical work in social medicine and in the milk laboratory. During the hours spent on the former the student is brought into contact not only with the special social-medical work of the pediatric department as a whole, but also with the general social work and social-medical work as carried out by other organizations, such as the humane society, associated charities, tuberculosis dispensary, juvenile court, etc. The work in the milk laboratory consists in first-hand demonstrations in the preparation of the various milk modifications and foods that are fed to infants."

The outlook for more extensive and at the same time more intensive work for babies and older children was never brighter. We are learning as never before the worth of the babies. It is absolutely necessary, if we are to strengthen the fibre of the nation, to pay more attention to the welfare of our children. The great war has impressed as never before the grave necessity not only of conserving the children, but of affording them every opportunity to develop normally. It has become a patriotic duty, as well as a professional one, for the physicians who come into close touch with the family life of the nation to thoroughly inform themselves of the best methods of preventing infant mortality and of conserving child life. The day is rapidly passing when the general practitioner of medicine can look upon his "private practice" among children as simply a professional relationship between himself and the sick baby in the family. Every such relationship implies a community interest as well. The community has certain rights regarding the care of children which it must safeguard, and it is justified in demanding a high grade of preliminary education and medical service from the physicians of the community. The whole trend of modern child welfare work demands closer coöperation of the physicians with all organisations working for the welfare of children. It is not too optimistic to predict that every medical school worthy of the name will make ample provision for the instruction of its students in every phase of pædiatrics bearing upon the welfare of the child.

PROBLEMS OF THE RURAL MOTHER IN THE FEEDING OF HER CHILDREN

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A review of the bulletins written for mothers on the care of infants, especially on the subject of infant feeding, would give one the impression that they were not intended for use outside the city limits. In this literature the two points most emphasised are the value of breast-feeding versus bottle-feeding, and the use of certified milk, properly modified and kept on ice.

My observation and experience has been that breast-feeding versus bottle-feeding is not one of the vital problems of infant feeding for the rural mothers, as undoubtedly it is in the cities, for approximately 70% to 90% of rural women nurse their infants for at least six months. Also, properly modified cow's milk kept on ice until feeding, is out of the question for the great majority of them, for it is only the exceptional farm which can provide ice.

It would be interesting to examine the factors which determine the larger percentage of breast-feeding in the country than in the city, but chief among them are:

1. The work of the mother is largely in the home. Hence she is available for regular periods of nursing.

2. If the country mother leaves home usually she has to go so far that she takes the baby with her.

3. The country woman lives a less artificial and more simply natural life than is possible for the woman in the city.

4. Bottle-feeding is not suggested to her by the example of her neighbours.

5. There is no obliging doctor around the corner who is willing for her to assume the responsibility of artificially feeding her baby.

For these, and, perhaps, other reasons, the great majority of babies in the country are breast-fed. But this breast-feeding is not always successful, complicating factors being:

1. There is likelihood of weariness of the mother from overwork, or from arising too soon after delivery.

2. Injudicious diet of the mother.

3. Lack of fresh air and proper exercise.

4. Lack of proper mental stimulus and freedom from worry.

5. Irregular intervals and improper methods of nursing, frequently

followed by the so-called three month's colic or other form of indigestion, and often taken as an indication that the milk is not agreeing with the baby.

6. Failure to weigh the baby, or weighing only at very irregular intervals.

7. Nursing the baby after the first birthday, sometimes until the second. All these problems are very easily solved, and it will only be a question of time at the present rate of dissemination of information regarding the feeding and care of infants until the necessity for proper nursing and methods will be matters of common knowledge.

It is the problems of bottle-feeding and feeding of the child after the first year that present the most serious difficulties in rural infant feeding. These problems might be grouped under three headings:

1. Infant food other than milk.
2. Milk and its care.
3. Table food after the first year.

In the better rural communities the problem of infant food may be solved by keeping one or two cows for the express purpose. In many other districts patent or ready prepared foods are in great favour. The foods most frequently used are those advertised in the lay press. The comparatively high price of those foods; the alluring advertisements; the full directions for preparing them; the lack of proper information as to their relative lower food value as compared with cow's milk; the father- and mother-love desiring the best for their baby; together with their lack of facilities and knowledge of the technic for feeding cow's milk—are all factors in promoting the use of patent foods in rural districts.

But if milk is decided upon to be used for bottle-feeding, immediately other problems arise, such as healthy cattle, proper handling of the milk and utensils, lack of proper methods of cooling, and, lastly, the lack of proper knowledge in its modification.

The health of cattle, especially as to freedom from tuberculosis, is not one of the serious problems of infant feeding, as it is in the city. Dairy cows are tested for tuberculosis when milk is to be sold in the cities having milk inspection ordinances. There is no general provision for testing cattle in rural districts when milk is used for home purposes, however, experience goes to show that it is a rare thing to discover a cow suffering from tuberculosis when only one or two cows are kept on one farm, and these kept most of the time in the open pasture.

Proper handling of milk can be summed up in the statement that a "clean man can produce clean milk anywhere." Clean milk is not a

problem of fine dairy barns and elaborate equipment, although these may be a great convenience, but the essentials may be carried out anywhere. These are proper care and cleanliness of cows, stables, milkers, pails, cans, the removing of the milk at once from the barn to a separate cooling and straining place, and the quick cooling and the keeping cool in properly sterilised vessels.

With a satisfactory milk supply and provision for keeping it safely assured, the next problem is the proper modification and formulæ for each individual baby. For the rural infant this is likely to be a matter of no small concern.

It is a fact that the average practitioner who graduated anywhere from five to twenty-five years ago, did not receive instruction in the feeding and care of normal infants, particularly as compared with modern methods. The doctor's function was considered, then, as it is all too frequently now, to diagnose and to prescribe for illness. The medical student of these days did not see normal babies in the clinics or practice, and he had no opportunity for observing and feeding them at various stages of their development, hence, unless the practitioner has had experience with a family of his own, or he has had children under his immediate care, unless he has taken frequent post-graduate work, or has been a close student of current medical literature, he is not expert in writing formulæ for bottle-fed babies, and he finds difficulty in outlining diets for young children. In extreme cases, some physicians have been reduced to the experience of ordering condensed milk and instructing the mother to read the labels on the cans.

The public has been educated to go to the doctor and pay him for medicine and not for advice. Also it takes time to teach a mother how properly to prepare formulæ and diets, and the average busy doctor hasn't the time. If he took the time, in all probability he would not be paid or thanked for it. Therefore, in the average community, it is easier and quicker, and is the means of a better immediate income, for the doctor to send the baby some medicine for the colic or for the diarrhœa than it is to go painstakingly into the cause of these ailments. Some wise country doctors keep on hand some harmless coloured sugar pills to give for the dollar, and give good advice gratuitously.

Frequently it happens that the country mother is too far away to send for a physician for an apparently trivial ailment, something which she expects will be better or alright in a few days, or she feels that having him come so far is more than she can afford, consequently she is strongly tempted to experiment with home remedies.

In some communities, too, particularly among the foreign-born people, a mistaken sense of thrift or ignorance of our customs, pre-

vents their sending for a doctor until the family and the neighbours have done their best, or their worst, as it may happen, and the child is near death. There are certain districts where this practice is so prevalent that when a doctor is called to attend one of the children, he goes expecting nothing else than that he will have to write a death certificate.

The rural mother lacks the opportunity for the frequent consultation with public health nurse, teachers, physicians in the clinics or infant welfare stations, which do so much toward simplifying the city mother's problems of infant feeding. Hence, apart from her relatives and neighbours, the only available source of this sort of information for her is the magazines, which in the last few years have taken up the care of children as a part of their regular activities. Some of these articles of advice have been written by space-writers and consequently are of doubtful value. But for the most part, and, especially in the first-class magazines, these infants' and children's department are conducted by physicians and specialists, and these publications have performed a wonderful service for the rural mothers.

Leaving the problems of breast and bottle-feeding, the rural mother also finds special problems in the feeding of infants after the first year. Ordinarily she does not know how to take her baby from the breast or bottle and put him safely on solid food. Consequently she experiments with tastes of this and of that with the usual result.

There is likely to be a scarcity of fresh fruit and green vegetables, also and a too plentiful supply of fresh and salt pork. This makes it difficult to obtain proper materials for a correctly balanced diet.

Outside of food and its preparation, there are a number of other problems which bear directly on rural infant feeding. Among these may be mentioned—

1. Lack of facilities for the proper disposal of garbage and sewage.
2. Unsanitary toilets.
3. Dirty barnyards and pigpens.
4. Rats and flies and other disease-breeding pests.
5. Pollution of the water supply.
6. Lack of conveniences in the farm-home, and difficulty of obtaining domestic help.
7. Lack of opportunities for consultation.

Perhaps the most serious of these problems is the lack of disposal of garbage and waste, with all its attendant evils. The unsanitary slop barrel, the dirty pigpens and barnyards, and the unscreened, filthy toilets are a prolific source of rats and flies, with their possibilities of

pollution of food supplies. The average rural toilet, which not infrequently is a miniature cesspool, also may be responsible for contamination of the water supply of the family or the neighbours.

The difficulty of obtaining domestic help and the lack of modern conveniences are vital problems for the rural mother. An overworked mother cannot supply the proper amount or quality of milk for her infant, neither can she take the necessary care and precautions of modern conveniences, especially a furnace and a properly equipped nursery, means that in the average farm-house the mother must keep her young children with her in the kitchen. Here they are exposed to overheating from the kitchen stove, both in summer and in winter; they are exposed to drafts and cold floors, to steam from washing and cooking; and they are placed within reach of sundry bits of indigestible food and stray articles, which are surreptitiously swallowed.

AUTO-SERUM TREATMENT OF CHOREA

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Recent researches on the bacteriology of chorea have resulted in the repeated finding of a mocro-organism either in the blood or in the tissues of the central nervous system. Contrary to this a great many skilled investigators have been unable to obtain positive findings. The organism most frequently found is a coccus belonging in the general streptococcus group, and very similar to the coccus originally described by Poynton and Paine. Within the past three years many positive streptococcus cultures have been obtained, in cases of chorea, from the teeth and tonsils, while the blood cultures have been usually negative. These septic foci have, in many instances, been undoubtedly the source of the infection, but, unfortunately, the eradication of these foci does not, in many instances, effect a cure of the chorea.

There are a large number of observers who believe that Sydenham's chorea is essentially a manifestation of rheumatic fever, and that it represents an organic disease of the brain, which attacks all parts of the cortax equally and impartially. There is still some difference of opinion among those who hold the view that Sydenham's chorea is essentially a manifestation of rheumatic fever infection, as to whether the disturbance in the central nervous system is caused by the direct presence of bacteria or by the presence of bacterial toxins absorbed from some other part of the body.

There are many who believe that chorea is always a manifestation of infection, that rheumatic fever is the commonest infection which produces the manifestations, but that other infections may, at times, produce the disease. This view would explain the cases which occasionally have been observed to follow other infections, such as scarlet fever. It is interesting to note that the other diseases with which chorea has been associated, are conditions in which streptococci are frequently found. Rosenow's observations on the transmutation of bacteria of the streptococcus pneumococcus group, and on the ability of this group of organisms to change their selective affinities from time to time, is suggestive in connection with the occurence of chorea, not only as a manifestation of rheumatic fever, but of other streptococcus infections.

On the other hand, other observers, while admitting the association of chorea and rheumatism, believe that chorea represents a functional disturbance due to a variety of causes—and among these causes infection is one, and, of the infections, rheumatism is the most common. In addition to this, however, they feel that the various factors of hygiene and environment which produce functional disturbances in general, may be responsible for some cases of chorea without the medium of infection. This view might possibly explain the instances in which chorea has apparently developed after a fright or mental shock.

The question of the pathological anatomy of chorea is closely connected with that of its bacteriology. The view appears to be gaining ground that chorea does not represent merely a functional disturbance of the central nervous system, but that it is characterised by organic lesions of the brain, which, while only temporary, are none the less actually present. Loubet concludes that the lesion is a mild encephalitis caused by the toxins absorbed from an infection without the actual presence of organisms in the tissues of the nervous system. The majority of French observers appear to hold this view. Both American and European observers have noted the appearance, at autopsy, of congestion, thrombosis and peri vascular infiltration with small cells, while Poynton and Paine have, in addition, noted streptococci in the pia mater as well as in the brain itself.

The relationship of chorea to syphilis has been suggested and disproved. The changes in the blood and examination of the spinal fluid have also been intensively studied, but nothing of any importance has been found.

In 1912 A. L. Goodman, of New York, was attracted to the subject of chorea therapy when two of his cases developed classical symptoms of miliary tuberculosis and died. At autopsy it was found that the tubercles were restricted mostly to the central nervous system. It occurred to this observer that the inability to effectively bring about a cure was due to the fact that all previous methods employed were ineffective in that they did not reach the seat of the trouble, which exists in the central nervous system. Being thoroughly convinced of the infectious nature of the malady, he felt that measures directed to the central nervous system would be of great benefit.

It is not within the scope of this paper to discuss extensively the theoretical aspects of this treatment. There are many gaps in our knowledge, both of the pathology of chorea and of the drainage of the subarchnoid space and the ventricular system, which must be filled before we can expect a very satisfactory explanation.

In view of the fact, however, that chorea is generally recognised as a bacterial disease, due to a streptococcus of the viridans group, certain anti-bodies must perforce be in the circulatory blood plasma, which anti-bodies do not enter the cerebro-spinal fluid on account of changes in the choroid plexus, which do not permit the transmission of these anti-bodies into the spinal canal. When the serum is injected into the canal certain chemotaxies action takes place, and the walls of the choroid plexus again become permeable.

Technic

It is most essential that both tuberculosis and syphilis be excluded, and that all drug therapy be suspended, for at least five days previous to the injection. Most serious results have been encountered when this latter point has not been adhered to. Drugs circulating in the blood plasma have a many times more potent effect when injected into the canal and serious results are thus obtained, particularly after the use of salicylates, when very toxic symptoms of salycilic acid poisoning have presented themselves.

In practically every instance the treatment was administered in the out-patient department, the patients returning home within an hour or two following the injections. The first step consists in withdrawing about 50 c.c. of blood from the median basilic vein. In some instances, an anæsthetic is necessary, as the patient is often too nervous to keep still sufficiently long to obtain the amount of blood required. Ethyl chloride is the anæsthetic employed. It is important to have the tourniquet applied just tight enough to slightly impede the venous return in the arm. If the pressure be great enough to impede the arterial flow, of course one soon empties the arm of the venous blood and no more can be obtained until the tourniquet is released. A nice plan, in this connection, is to use a blood pressure band on the arm, and have it inflated to about two-thirds the blood pressure. The blood is received into three sterile test tubes, the rubber tubing and needle having been previously sterilised, and held so that the opening in the test tube is protected from contamination by a piece of sterile gauze wrapped around the rubber tubing down to its point of entrance into the test tube. The tubes are stopped with sterile plugs and set aside for a few minutes to allow the blood to clot. Before putting in the centrifuge, a sterile platinum loop is run down inside each tube to separate the clot from the test tube to facilitate in obtaining the greatest amount of serum possible. The test tubes are then put in the centrifuge for thirty to forty minutes. At the end of that time the serum is drawn up in a sterile pipette, emptied into a sterile test

tube and put in the incubator to keep at the proper temperature for injection. In our first few cases, the serum was inactivated before injection. At present we are omitting this, trusting to our technic to keep the serum sterile. The preparation of the serum takes about one and a half hours. From 50 c.c. of blood we obtain 20 to 25 c.c. of blood. The patients come to the out-patient department about 9 a.m., and the serum is ready at 11 a.m.

The patient is prepared as for a lumbar puncture. As we always give an anæsthetic, he has no breakfast. The serum is drawn into a 20 c.c. record syringe which fits the ordinary lumbar puncture needle. The patient is then ànæsthetised with ethyl chloride, the needle inserted and about 20 to 25 c.c. of spinal fluid withdrawn. The record syringe is then attached and the serum slowly injected. This is the crucial step in the operation, as it is essential to give as much serum as possible without causing pressure symptoms. As one slowly injects the serum, when sufficient has been injected, one feels an obstruction to the entrance of the serum. This is very definite, and tells the point to stop. Injecting more, after this resistance has been encountered, invariably results in marked pressure symptoms, such as vomiting, severe headache, and elevation of the temperature, etc. An anæsthetic is necessary to enable one to detect this sense of resistance. In our series of cases we have used on an average of about 17 c.c. of serum.

The patients are kept in the hospital for one to two hours to watch for pressure or heart symptoms. They are then sent home to bed for one week, when they return to the hospital. In the interval, the public health nurse visits them to see that instructions are carried out. Usually improvement follows in two or three days, and has become stationary again by the end of the week. When they return to the hospital another treatment is given.

Following the injection there may be a mild disturbance, such as slight rise of temperature, slight stiffness of the neck, increase in pulse rate. These rapidly pass off. Nothing solid is given to eat for six or eight hours following the treatment.

Results Obtained

Of the series of twenty-three cases, observed over a period of almost a year and a half, 77% were cured and 19% improved, and one case unimproved, this one having refused further treatment on account of a severe reaction. Of the cases observed over this period of time there have, so far, been no recurrences. In all instances, except six, in which the tonsils were removed, there were observed, apparently, foci of infection, which were attended to after the course of treatment.

Of the twenty-three cases, seventeen were of mild degree and five were severe. In four instances the duration of the disease was over a one-year period, while the remainder showed symptoms, on an average, of six and a half weeks' standing.

The average number of injections given were three, but seven were given one injection, while in one instance, five were administered before a cure was effected. The average amount of serum employed was 17 c.c. Nineteen cases were cured in three weeks. All the severe cases required more than one injection.

Discussion

In practically every instance there had been previous medical treatment given, with the usual indifferent and unsatisfactory results. In most cases, there was a mild reaction in the form of vomiting, and an occasional thermal rise; and on only one occasion was the reaction of such a nature as to prevent the return of the patient to the clinic, owing to parental objection. The withdrawal of an equal amount of spinal fluid as serum injected did not appear to be necessary.

It occurred to us that failure to obtain satisfactory results and prompt reaction might be due to the lack of sufficient anti-body production in the plasma. This to us seems quite within the limits of possibility, taking into consideration the individual's varying susceptibility to disease.

Results

1. The Goodman auto-serum therapy, in our hands, has been productive of infinitely more satisfactory results than any other form of therapy. A cure of 77% of the cases being effected within three weeks' time.

2. The technic is so simple that it may be employed in any home, or out-patient department, under mild anæsthesia.

3. With the observance of proper precautions the reactions are negligible.

4. There have so far been no recurrence over a period of a year and a half, but more time is necessary, in order to give a more certain decision on this point.

THE BABY'S FATHER

HELEN MACMURCHY, M.D., TORONTO

We are all to be congratulated on the inauguration of the child welfare section of the Canadian Public Health Association. Fortunately, the aim of the section is clearly indicated by its name. What is the chief means by which we are to attain that aim? Perhaps it has never been better expressed than by the Right Hon. John Burns, then President of the Local Government Board, when he said at the first conference on infant mortality in London:

"Concentrate on the mother. We must glorify, dignify, and purify motherhood by every means in our power."

Most true. But who is the person to glorify, dignify and purify motherhood? Is it not the Baby's Father?

Perhaps those of us who have been working for child welfare owe the baby's father an apology. Have we recognised him as we should have? Have we been reckoning without our host? When one looks over the whole field, not only in our own country but in other countries, it is impossible to be satisfied with the slow progress and the scanty gains that we have made. In infant mortality—for example: It is true that modern work for the prevention of infant mortality began in the Edwardian era at the beginning of the twentieth century, and that some progress has been made. But still, compared with what ought to be, we cannot feel that results are satisfactory, except perhaps in New Zealand. If this is the situation it is wise to try a new point of view, to be willing to make a radical change in our methods if necessary, to acknowledge that we have been wrong, if we see it that way, and to call to our aid any new ally and to avail ourselves of the leadership of those whom we may have up to the present time ignored or neglected.

Would it not be well to put our case before the Baby's Father? To associate him more closely with our work and to remind him that after all he is the leader and we are only his agents, his advisers and helpers? We are in the position of Diogenes who was looking for a "Real Man." We are falling back upon the father because we have to, and we shall not ask for his help in vain. His answer may be as prompt and as faithfully kept as the words with which a great king of Israel comforted his weeping people—"To-morrow by the time the sun be hot, ye shall have help." One of the greatest new powers that the present awful war has liberated in the world is the power

of action. People are not quite as dilatory as they were before the war.

The Five Armies

When the doctor looks at the question of infant mortality and child welfare, he sees five armies, all under the banner of Death. The leader of the First Army is the shadowy form of the Baby who Never Has Been, whose only existence was in the kingdom of hope.

It is long ago since "The Silence of Dean Maitland" was the most popular novel of the year, but there may be some who read these words and will remember a young surgeon, Dr. Everard, who was condemned to life-long imprisonment as a result of the silence of Dean Maitland about the crime of manslaughter of which he, and not the surgeon, had been guilty.

Twenty years after, the surgeon was released from the penitentiary, married Lilian, who had been faithful to him all these years, and they sat down together at last at their own fireside. "He thought and wondered, did Lilian think too, as she sat by his side, of another little group of child-faces who might have clustered around their hearth." Around that fireside were the ghosts of their children who never had been and now never could be. This is the first army that the nation loses—the Army of the Baby that Never Has Been.

But the name of our penitentiary is not Portsmouth or Stony Mountain, but Selfishness, and the reason that this baby has never been rests not so often with hard fate as with our own unhappy lack of thought and failure to realise where the real success of life is to be found.

The Second Army is led by another shadowy form—the Baby that Never is Born. Better care of the mother, more common sense and kindly consideration by the father, careful instruction and education by the right people and in the right way as to the preparation for parenthood would save a great many of those who now perish unborn. Sometimes we all do our best and yet fail—to do better still later on. And surely there are not many Canadians who do not live clean lives.

But when all this has been stated and agreed and insisted upon it still remains true that spade must be called a spade and the name of the Spade in mortality before birth is sometimes Venereal Disease. Public opinion has moved with such marvellous swiftness upon this subject that it is possible now to do more good than harm by efforts to combat veneral disease. Indeed it is now possible to do a great deal of good, and a great deal of good has been done and will be done. This second baby is the type of an enormous loss to the nation in man-power and woman-power. Dr. Amand Routh and other eminent authorities estimate that infant mortality before birth from all causes

deprives us of a number of potential lives equal to the number that we lose in the first year after birth, that is, it doubles our infant mortality.

The Third Army is led by the Baby Who Arrives only to Depart. When David Copperfield found that the task of making his wife Dora a wiser woman was beyond his power, he hoped that "smaller fingers" would have been able to accomplish it. "But it was not to be. The tiny spirit fluttered for an instant on the threshold of its little prison and then, unconscious of captivity, took wing." Another very important part of our national loss occurs within a few days or even hours after birth.

The Fourth Army is led by the Baby that is Carried out of Life. Before he has knowledge to cry "my father" or "my mother" the land is bereaved of the child. In 1911, at the Royal Academy Exhibition in London, the great picture of the year was Mr. E. Blair Leighton's "To the Unknown Land." In the foreground a beautiful female figure kneels at the margin of a river, her face buried in her hands, her long black robe falling in lines of wonderful grace and beauty about her figure, majestic in the dignity of grief; on the flood of the river a ferry boat with the grim ferryman just dipping his oars, and in the stern of the boat a "dear and great Angel" tenderly bearing a little baby asleep.

There is no national loss more poignant or more unnecessary than the loss of a baby under a year old.

The Fifth Army is led by the Ex-Baby—the child under school age, the child who walks out of life on his own feet as it were. Some desolating disease, some untoward accident, carries him away and the nation loses another citizen.

Of all the horrors of peace the worst is infant mortality. Why is it? Because of our ignorance, inefficiency and lack of national imagination. The average citizen is not seised of the importance of this question at all. He has not had it put before him, yet it is a great national question and one that the average citizen will have to give his attention to. In other words, we must, as has been already said, state our case to the Baby's Father and secure his leadership, help and cöoperation in this crusade, and we shall do it now with increased force because of the unanswerable arguments that we can now use. The appalling national loss which is the price we are freely paying for the freedom, the justice and the peace of the world can only be made up in one way. Infant mortality is the only other loss of citizens that compares with our losses in the war. The only place where we can adequately economize in our peace-time waste of man-power and woman-power is here in our infant mortality loss.

If any argument is needed to show that the Baby's Father is the one that can help us we might refer to the statistics of the registrar-general of England and Wales in regard to the death rate under one month. It should first be mentioned that formerly the opinion was held that deaths under one month were 75% irreducible, that is, it used to be thought that these deaths could not be helped, that the causes were beyond our control. Now we know better. We do not believe a word of the irreducible theory. The death rate under one month where the Baby's Father is a doctor, a merchant or an artist, is below 25 per 1,000 births, and where the Baby's Father is a miner, a navvy or scavenger, the death rate under one month is 45 per 1,000 births.

Again the death rate under one month in a place called Watford, England, is 19 per 1,000 births, but in a place called Workington it is 45 per 1,000 births. So what we need to do is to study the problem before us so as to understand it and do something to set matters right.

Consider this. The general infant mortality rate is 100 per 1,000 births. But the "illegitimate" infant mortality rate is 200 per 1,000 births.

That is what happens when the Baby's Father never reports for duty at all.

What then shall we do? Two things are obvious. First let us take the Baby's Father into our confidence. Tell him that there is a war on and get him to enlist and report for duty. We have never told him yet that child welfare depends on him, and how should we expect him to know his duty if no one explains it to him? How do we learn our duties as physicians? Our professors, instructors and clinicians drive them into our hearts and minds steadily for five years. Anything that they forget (which is not much) is driven into us by the general public and our patients. They soon let us know what is expected of us. As Kipling said: "It is required of you in all time of famine, plague, pestilence, battle, murder and sudden death, and you report for duty at once, that you go on duty at once and that you stay on duty until your conscience absolves you or your strength fails you—whichever happens first."

But did we ever tell the Baby's Father what was required of him? Did we ever say that this was national service? Do we ever treat the man who has made a home as any better than the man who has not?

"There is one more bit of advice in these days which we might give to young men. The war seems to make it somehow wrong that a young man of decent character, in good health and steady work, should remain unmarried."*

*Stephen Paget.

What we seem to need is a change in public opinion. We cannot interfere with people's private affairs, you say. No, I know that. But we could show that we have a higher opinion of those who make a home. We could use our influence in the right direction. Probably those with whom we have influence would be profoundly impressed by anything we might say to them. How do they know we care anything at all about it? We could show them that we cared.

Our second very obvious duty is to treat the average citizen as the Baby's Father ought to be treated. When the census man says, "This man is a scavenger," the Country says, "Oh, no, we have changed all that. He is the Baby's Father." When the school says, "This is a boy of fourteen just leaving school," we say, "Not a bit of it, he is to be the Baby's Father." When the employer says, "You cannot give every man a minimum wage" we say, "The Baby's Father must have a living wage at least, and a good one, but of course he must work for it." In other words a man must have the wages, the housing and the education that the Baby's Father needs.

The Real Success

"Daddy" wrote a letter. It was from Paris, where, apparently, he had been sent by the United States on a diplomatic mission. After telling something of what is going on, the letter mentions that on the writer's desk is a photograph of the boy to whom the letter is addressed—his first picture in khaki. This is the last paragraph of the letter:

"Let me whisper a secret. While it has tickled my vanity to know how proud you are of the old man's little successes, and it has been a real spur to me, yet all the while I know, and so should you, that you are my real success. All that I ever dreamed of doing or being I know you will accomplish if you come through this war alive.—Daddy."

The Baby is the Real Success.

THE RESULT OF THREE YEARS' WORK IN THE DEPARTMENT OF CHILD HYGIENE, TORONTO

GEORGE SMITH, M.B., TORONTO

The story of the early struggle in child welfare in Toronto is much the same in every city. The same distrust is met with in the medical profession and the public. Passing over this phase of development, it is the speaker's intention to give an outline of the working of the department of child hygiene at present, including information derived from our past work, and some of our plans for the production of healthy children and the lowering of our infant mortality rate.

At present there is held at the Toronto General Hospital a clinic for the purpose of giving advice to pregnant women. Urinalysis are performed, blood pressure taken, and pelvic measurements made. It is expected that similar clinics will be held at three other large hospitals in the near future. A movement is on foot for the further care of the mother, by the establishment of a mother's pension fund. A mother's pension, combined with a prenatal clinic, will give an ideal arrangement, resulting in the better care of the children at home, and in the mother being able to prepare herself for the proper feeding of her expected infant.

Our system, just now, only gets started when a birth is registered at the City Hall. A booklet on infant care and feeding is at once mailed to the mother. This booklet is revised yearly to keep the matter strictly up to date, and in advance of the booklets sent out by many patented food companies on these subjects. Probably more important is the visit of the public health nurse. The visit being made as soon as possible after the birth is registered. This visiting and other work, done by the public health nurse, is often difficult, great tact being necessary to win the mother and to do nothing to antagonise the visiting physician. Their work is entirely to help both. The mother, in taking care of her child; and the physician, by seeing that breast-feeding technic, etc., is properly carried out. One great obstacle in the way, at present, is the latitude taken in the registration of births by the physician and parents. It is expected that legislation will come soon which will compel compulsory registration during the first twenty-four to thirty-six hours. This will enable the nurse to get in on the case early, and will, no doubt, have the effect of greatly increasing the efficiency of her work.

If the physician is willing, the nurse arranges for the mother to attend the nearest infant and child welfare clinic: of these, we have some twenty-two scattered over the city; five being in institutions and seventeen in buildings arranged for by the public health department. These clinics are designated "Welfare," because no sickness is looked after; only such details as technic in breast feeding, weighing of infants, checking up artificial foods; in other words, looking after well infants and children. When the clinics started only infants were cared for; now not only the infants but also the children of pre-school age are admitted; the plan being to follow the infant from birth on through the pre-school age, then under the school physician for the school period, all tending to produce not only an intelligent child but also a healthy one.

Mens sana in corpore sano.

In selecting the areas for new clinics we have made use of a pin map, showing the infant deaths throughout the city. On three or four occasions, a clinic has been established where the mortality seemed the greatest. While our observations along this line has not been sufficient to give definite conclusions, still we are satisfied that a considerable decrease in the death rate has been made in these areas.

To emphasise the fact that the clinics are not for sick children, and to gain the coöperation of the neighbouring physicians, a card (as follows) is sent out to the attending physician when a new case goes to the clinic, "You are recorded as the attending physician of this family. With your approval, the clinic would be glad to maintain supervision of the child, the case to be referred to you in event of illness. Any records we may have, such as weights, feeding, etc., will be available to you at any time. Your interest and coöperation in this work would be appreciated."

At attendance at each clinic are one or two nurses, and a clinic physician. Both are well trained in this work. The physicians attend the Hospital for Sick Children for courses of instruction in feeding and other phases of child welfare work. The nurses are all graduate nurses, paid by the public health department. The actual work in the clinic requires careful supervision. The physician should see all the new cases, and as many of the old cases as require attention. In connection with our clinics we keep a detailed account of the hours of attendance of the physician and nurse, the number of old and new cases, the number of cases seen by the doctor, and the average time given to each case. For example, in the month of March, the figures were as follows for one of the clinics:

Attendance of physician 100%.

Doctor spent five hours, nurse nineteen hours thirty-five minutes.

Cases, seventy-seven. New cases, ten. Seen by doctor, forty-seven. Seven and a half minutes for each case.

This is done to create competition and increase the efficiency.

The statistics for the past month have brought up several interesting questions. For example, some physicians see as high as 90% of the cases, while others see only 50% to 60%. The question arises, how many and what cases should be seen by him. It seems to the speaker that the solution to the question lies in having a well-trained and tactful nurse. She should be able to pick out the cases to be seen by the doctor, and be able to handle the other cases so that the mothers shall all be satisfied. To do this the confidence of the mothers must be gained and held by her. They must be convinced that she knows her work. So the best nurses should be picked as clinic managers. This enables the physician to go into all the new cases well and so give that confidence to the patients, and they will know they are being well treated. This advertises the clinic and holds the case. The relief, from the cases not requiring to be seen by him, gives the physician additional time in which to give talks to the mothers as a whole. The nurse, also, should give short talks to the mothers as a whole. The nurse, also, should give short talks on subjects which she knows from experience her particular charges need. By doing this she not only helps her mothers in their difficulties, but by this means will often gain their confidence in her ability.

At some of these clinics two or three nurses are required. As much as twenty to twenty-five hours a month being given to a clinic; which means five to six hours a day. If the nurse is to run the clinic properly, she must have plenty of help. To this end we think it would be a good plan to have on hand two or three voluntary workers. The latter should be carefully chosen, and then given a few hours' instruction in this work. They could easily be trained to weigh the babies, in fact, do all the preliminary time-consuming work. Judging from our experience with voluntary workers at the Hospital for Sick Children out-patient department, excellent service would be given by them. Follow-up work could also be done by them. The success of the clinic depends upon good organization, with good workers, who come on time, and who, all the time they are there, show the mothers they are vitally interested in their welfare.

In 1913, 364 clinics were held, with an attendance of 3,926; in 1914, 830 clinics, and an attendance of 10,809, while in the year just past 1,033 clinics were held, with an attendance of 16,849.

Publicity and Propaganda.

1. Newspaper. Many personal experiences have taught us that the great percentage of mothers are anxious to learn everything that will help them in bringing up their children. One is equally convinced that mothers not so keenly interested may be educated to acquire this desire for knowledge. The public as a whole, through popular magazines, lectures, etc., are becoming readers of public health problems. Feeling this to be the case, our department, for the past nine months, through the kindness of Mr. Cranston, editor of the *Toronto Star Weekly,* have acquired, for this purpose, as much space as we care to use in this well-known weekly edition. The newspaper medium was thought adviseable for at least three reasons. The first, that we might advertise the welfare clinics as widely as possible. To this end a complete list of the clinics, their location and time held, is frequently printed at the end of our welfare articles. Following this the mothers are extended a hearty invitation to come to the clinics. The second advantage gained was that we hoped to teach a great many helpful principles to such mothers, who, perhaps, live in the country, or even in the city, but were unable to attend the clinics. During the past few months the following subjects have been taken up in this way: "Advantages of Breast Feeding," "Proper Technic in Breast Feeding," "Disadvantages of Patented Food Feeding," "Proper Artificial Food Feeding," "Care of Infants," "Communicable Diseases," "Exercises for Children," etc. These articles are timed to suit the seasons. At present, as the hot months approach, a series of articles on feeding and food problems is being prepared. Besides original articles, helpful reading material is copied from other sources. The third reason for acquiring newspaper space, that a question drawer might be started. From the number of questions being received, it is thought that this will become a very instructive department, as the questions are very carefully answered, with a view of giving as much help as is possible in this way. Some letters are answered direct, but the majority are printed in the paper the following week, in this way reaching, besides the sender, all the other readers.

2. Mothers' Meetings, etc. To do the best child welfare work, one must get in personal touch with the mothers. Through the clinics only a certain number can be reached. There remains a large class who do not go because of failure to understand their purpose, or some other reason. In an effort to reach some of these, a letter is being sent to each minister of every church in Toronto asking for coöperation in this matter. The principles involved in child welfare

work are pointed out, and an appeal is made for addresses along this line, and for the formation of mothers' clubs for study of infant and child problems. To address these mothers, a class of some twenty public health nurses has been formed. They have been chosen with a view of getting good, tactful speakers. They are now being put through an intensive course on such subjects as "The Importance of Immediate Isolation for all Sickness, besides the so-called Communicable Diseases," "The Function of the Nose and Throat in relation to Adenoids and Tonsils," "The Caloric Method of Feeding," "Disadvantages of Patented Food Feeding." They will be prepared to give three or four talks, and be able to advise on any question which may come up. It is expected that these will be excellent, comprehensive addresses. Already two nurses have given talks which were well given and very much appreciated by the mothers addressed. By these classes we expect to reach some of the best homes in the city; homes where advice is often needed just as much as in the poorer districts.

Beside the clinics which we have been describing, work is done in conjunction with the Hospital for Sick Children, to keep the babies from falling behind after they have been corrected in the hospital and sent to their homes. Two methods are used in an effort to accomplish this. The first is a follow-up system. All cases are discharged from the hospital with a card to report either to a child welfare clinic, or, if it has been a difficult case, back to the hospital out-patient department. At the same time a duplicate card goes to the public health supervisor at the hospital. If the case does not report at the proper place at the time designated, a post card is sent out making a second appointment, a nurse visits the home to see why she has not done so. In this way, constant supervision is kept over the infants, whose resistance is not very good on account of previous illnesses. The second measure is a child-placing department, under the charge of one of our public health nurses. She has two or three foster homes under her supervision to which are sent infants requiring careful attention; perhaps their home surroundings are bad, or they may be orphans. At any rate they are placed in these homes until a higher plane of resistance to disease and greater tolerance of food is reached.

As a result of all these measures for safeguarding the infants, the infant mortality rate has been consistently dropping. When the clinics started there were about 115 deaths per 1,000 births. Last year, the rate reached the very low figure of eighty-five per 1,000 births. This result is, we feel, a sufficient reward for our labour.

SECTION V

PUBLIC HEALTH

PRESIDENT'S ADDRESS

H. W. Hill, M.B., M.D., D.P.H.

Director, Institute of Public Health, London; M.O.H., London; D.A.D.M.S. Sanitation, M.D. No. 1

Gentlemen,—Our convention this year is held on the eve of a great public health advance which has come so quickly, and so quietly at the end, and, I hope, so completely, that we have hardly had time to realise it. Health officers have been regarded as outcasts so long, as back yard inspectors, as official cranks on cleaning up alleys, that the recognition of the health officer as a definitely useful member of the body politic was not so long ago regarded as a grudging concession to the health officer's own feelings, not to his actual value. With the advent of a smallpox epidemic we M.O.H.'s became, for a moment, men of importance, but as the epidemic waned, we returned into the obscurity, and so remain until next time.

The war has brought public health into its own; not alone in infectious diseases in general, but from July 1st, 1918, as the storm centre of the general attack on diseases more important even than tuberculosis, viz. syphilis, gonorrhœa, chancroid.

The health officer will, in the next few months, make more impression on his community than he has done in the past five years; and I understand that the provincial government is more than ever behind each health officer who seriously and efficiently proceeds with the new and onerous tasks laid upon him.

Gentlemen, I could give you statistics, but here it is unnecessary; and you know as well as I do that there are three great lines of public health work to-day, tuberculosis, venereal diseases and child welfare: each a great field, all overlapping somewhat, yet each having its own special features. The other infectious diseases are relatively small matters. Typhoid fever and smallpox are all but things of the past in civilian circles. Owing to antityphoid inoculation, typhoid is practically a thing of the past in our armies. Diphtheria, scarlet fever, whooping cough and measles take their toll, but on a relatively small scale; and, with a reorganised relation of the medical profession to the public, they will lose weight rapidly. Tuberculosis we know how to handle, although we do not by any means live up to what we know.

Child welfare we are anxious to do, and the public is anxious that we should do more than we have yet set out to do. Child welfare is largely a problem of which we know the solution. The venereal diseases, however, remain to be worked out, and it is up to the health officers of the War years to march carefully and plan wisely, and to bear the heavy brunt of the first attack upon the problem. It is a difficult one; but rather, I think, because of its psychology than because of its administrative difficulties.

Where shall I begin? Every M.O.H. has asked himself that question. Personally, I believe the answer is—with the notorious women of the town. We have such, known to be responsible for infection, and many will testify to that fact. They are suspects, and, therefore, may be examined as such. If infected, the law is clear. It will take a little nerve and the support of your police magistrate, and the government must be ready to provide a place for treatment. The nerve I know you have. You would not be M.O.H.'s if you lacked it. Police magistrate support you will get. The police magistrates, as a whole, are with us. But, for the places of incarceration for the infected, we must look to the government to provide. As I see it, we are helpless without them.

Gentlemen, a president of a child welfare association recently said that child welfare was not a patriotic movement, however much to be commended in other respects. I wish here and now to register my profound belief that, while at the moment the trenches represent the highest goal of patriotism and call for the maximum effort of the very best of us and form the essential without which everything else may become nothing, yet public health work remains the closest second to the trenches that we can conceive of, while within public health the urgent point is that same child welfare. But can we have child welfare worthy of the name if we preserve the children through their earliest years, to suffer syphilis, tuberculosis and the rest in later years? Why save the children, if we do not make the world safe for these children to grow up in? We fight the kaiser, and we fight syphilis, the kaiser of disease. Which is the worst? If your boy falls before a German shell, he has, at least, died a worthy death, but if he falls to syphilis, what consolation have you? The kaiser must die sometime, in the course of human events, but syphilis and gonorrhœa show no signs of old age yet. They are not paranoiacs, and I cannot see but that they form a group harder to deal with than Germany and Turkey. Our army has done a great service in these fields as well as in the other. It is for the civilian population, led by our own noble branch of the finest profession in the world, to win this victory, as the professors of arms are winning now the other.

THE VENEREAL DISEASE PROBLEM

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Officer in Charge of Venereal Diseases, Military District No. 2, Toronto.

The venereal disease problem, as I understand it, is a problem which is intimately bound up with many other questions affecting the public welfare. While its primary interest is the medical interest—the cure of existing cases, and the prevention of the spread of infection by curing disease—it is obvious that such means alone will never stamp out venereal disease. Behind and part of the venereal disease question is that of illicit sexual intercourse, or prostitution, and until an organised attack is made, not only on the more obvious causes, but on them all, little headway will be made.

In Toronto we felt that we should know something of our problem before starting out on any programme of prevention. The fact, that, unlike infected civilians, infected soldiers are quarantined, has made it possible to collect statistics which are not available among civilians. The evolution of the social case sheet in the Base Hospital for No. 2 Military District gave us an opportunity to study the social surroundings of a large number of infections, and a great deal of valuable information was compiled—much of which was summarised in a paper before this association last year. The general public is beginning to understand at last that the vigilance of army authorities is revealing the fact that the venereal disease situation in the country at large is very serious, indeed. The great majority of venereal cases found in the army were infected previous to enlistment. Practically speaking, the army has undertaken to count the number of venereal cases existing among a certain class of the civil population—and the results are startling.

Briefly, our investigations among troops quartered in Toronto, revealed the following conditions:

We found that our cases had not all received their infections in Toronto, and, that while over 50% of our infections had taken place in Toronto, that infected men were coming in, not only from almost every town and city in Ontario, but from other provinces, the United States, and many other parts of the world—and, that, so far as Canada is concerned, we have a national problem on our hands. By investigating the social conditions surrounding each individual infection, we gained information regarding the sort of prostitution existing

in various parts of Canada. We found that in a few parts of Canada, organised prostitution existed on a fairly large scale. In most parts of Ontario, energetic work on the part of the police, had eliminated it, and that the problem we have to face is that of clandestine prostitution. Frankly, we found that on the streets of Ontario cities many hundreds of young girls are ready to sell themselves at the behest of any stranger. We found that these young girls, a majority of them under twenty years of age, generally worked during the day—they were domestics, waitresses, clerks, munitions workers, cabaret singers, actresses, etc.—in other words, they depended largely on some regular occupation for their living. The fee of two dollars, which they charged to young men as unmoral as themselves, was used to supplement this regular income. We found, however, that a large number of young girls (nearly one-third of our cases) pursued this abnormal occupation without charging a fee. This complicated our problem, because the law has, in the past, only taken cognisance of cases in which a commercial transaction has been proven. In many of these cases, while a financial consideration was not forthcoming, a ticket to the theatre, a present of some sort, or a meal, seemed to take its place.

The place of infection was commonly the girl's boarding-house, although this was by no means the rule. Some hotels are not as careful as others, and often the simple expedient of registering as man and wife was successful. We found that a large number of infections had taken place in named parks. For instance, High Park, Queen's Park and Riverdale Park, in Toronto, and the Mountain, in Hamilton, were very commonly named as places in which infections took place. We found that in certain dance halls it is very easy for young men to pick up young girls, and that many girls who frequented these dance halls were both immoral and infected. We were able to trace a number of infections to meetings which took place in these places. We have found, also, that the automobile is very frequently used for immoral purposes, and is a factor to be considered.

Measures to attack venereal disease have been carried out under the general direction of an officer in charge of venereal diseases for the district. His duty has been, first, to generally supervise prevention and treatment in the army, and, by coöperation with civil agencies and authorities, to stimulate public opinion so that the essential things may be done among the civil population which will cut down the total number of new cases developing. I need scarcely say that any amount of work carried on in the army alone will not stamp out venereal diseases altogether, even in the army itself, because the source of infection is always in the civil population.

In the army briefly our methods are: Lectures on the danger of venereal disease by medical officers, distribution of literature to every recruit. This must be kept in the recruit's pay-book. Weekly inspections, and immediate removal to hospital, of all infected cases; isolation, treatment until cases are non-infective or cured; education of all infected men in the dangers of their disease, especially in the danger of marriage before cured. I may say that every effort is made to teach soldiers that absolute continence before marriage is the only preventive of venereal disease, and that every effort is made to discourage immorality. The double standard of morals is not approved in the army. For the man who exposes himself, despite all warnings, early treatment is provided. Men who do not take this treatment, and, therefore, develop venereal disease, are court-martialed.

The work outside the army in Toronto has been undertaken by The Advisory Committee on Venereal Diseases for No. 2 Military District, formed at the suggestion of the military authorities, and similar work has been commenced by The Advisory Committee on Venereal Diseases for Hamilton. The Toronto committee has grown until it now comprises 125 members. It is divided into sub-committees on education, laws, quack advertising, women's activities, medical aspects, speakers, and, lately, a committee of clergymen has been added. The personnel is composed of doctors, lawyers, newspaper editors, judges, business men, heads of women's organisations, etc., and an effort has been made to have official representatives on the committee from any societies, etc., which might be of general value, or of particular value, in working out any scheme which the committee felt should be pushed.

One of the most striking and valuable results of the committee's work has been the working up of public opinion. I think, that through the newspaper publicity which we have obtained, people in Ontario, at least, know much more about the dangers of venereal disease than ever before. The public at large owe a debt of gratitude to the newspapers which were bold enough to venture on this new field.

The distribution of various types of literature, not only on the venereal disease question, but on the question of sex hygiene, has been undertaken. The committee has supplied speakers on the subject—lately to meetings in Hamilton, to the Ontario Educational Association, to the Toronto clergy, and to numerous other organizations. Through our recently organised committee of clergymen, we expect to have the church give further attention to the subject.

Our legal committee has had, at least, something to do with stimulating the passage of the Ontario bill for the prevention of venereal disease—and, in passing, may I say that the sympathetic attitude of the Ontario government has been most gratifying. The passage

of this important piece of legislation, in such a short time, reflects the greatest credit upon the government.

The Women's Activities sub-committee has to date undertaken several important pieces of work. Among these have been:

1. The issuing of educational literature.

2. The bringing into active co-operation of such bodies as the Y.W.C.A., in order that various constructive plans might be carried out. The Hostess Houses erected in various camps are a result of their work as is the Women's Protective Association, recently formed in Toronto. There are now twenty-five, or more, women protective officers in Toronto streets, and I hope the movement will spread all over Canada. The names of our other sub-committees explain their functions.

A committee recently formed—not as a sub-committee of the advisory committee, but a committee, on the executive of which the advisory committee has representatives, is the committee on recreation for soldiers. This committee is for the purpose, primarily, of co-ördinating all existing bodies providing recreation in any form. It has, of course, stimulated the provision of new types of recreation, where such seemed advisable. We consider this committee to be an integral part of our plan for venereal disease prevention.

What of the future? We are beginning to know what venereal diseases mean as a drain on the most valuable—the human—resources of the country, and that, as causes of disease and death, they are unparalleled. They are a hindrance to army efficiency. Because they are so much more prevalent in civil life, they are a greater hindrance to efficiency in all departments of civil life, and in every class of society. We must realise that treatment should be available immediately for existing cases. Not only that, but we should take immediate steps to attack the whole nefarious business of prostitution, clandestine or otherwise.

It seems to me that the formation of local committees to study and work on the subject (and I understand that a number of such committees have been formed) would be valuable. The joining up of those committees into a national scheme should be accomplished as soon as possible. Possibly provincial committees, similar to the state social hygiene associations, existing in a number of states in the United States, would be useful. We are fortunate in having legislation to cover the question in Ontario, and also in Saskatchewan. The Ontario legislation covers the following points:

1. The medical health officer may examine any person under arrest who is suspected of having venereal disease, and may have such person isolated and treated if found to be infected.

2. Where the medical officer of health is credibly informed that any citizen is suffering from venereal disease and has infected, or is liable to infect other persons, the medical officer of health may cause that person to produce proof that he is, or is not, infected. If the person is found to be infected, the medical officer of health may compel him, or her, to be treated. This treatment may be carried on by the patient's private physician. If it is not carried out the patient may be quarantined, and treated by the health authorities.

3. The medical officer of health, or a legally qualified practitioner appointed by him, may enter in and upon any house, outhouse, or premises in the day time, as with other infectious diseases, for the purposes of enquiry and examination of the state of health of the inmates, and may take measures for the treatment of persons found venereally infected, or for the prevention of fresh infections.

4. Every hospital receiving aid from Ontario under the Hospitals and Charitable Institutions Act, shall make effective provision for the examination and treatment of venereal disease.

5. No person other than a legally qualified medical practitioner may treat or prescribe for venereal disease—under a heavy penalty.

6. The advertising of the cure or treatment for venereal disease is prohibited.

7. Anyone who knowingly infects another person with venereal disease is subject to a heavy fine or imprisonment.

8. The provincial board is given power to make regulations for the control of venereal disease.

If this legislation is to be useful, further organisation will be necessary to back up its provisions. The venereal disease situation is serious enough to require a separate department for its control, and, likely, a bureau of venereal diseases, under the provincial board of health in each province, will ultimately be found a useful means of coping with the situation. It seems to me, however, that if we had a Federal Department of Health, to stimulate and coördinate action in the various provinces, it would be easy to deal with the venereal disease problem as it should be dealt with—as a menace to the health and welfare, not only of some of the individual provinces, but throughout the whole Dominion.

Any organised method of venereal disease prevention must take serious cognisance of the social facts which we have learned. If organised prostitution is to be done away with, we must not forget

that it is not unnatural for young men and women to meet. We should make it possible for them to meet under normal conditions. The Hostess House in military camps is an attempt to meet this situation. If such provision is necessary for soldiers in military camps, why is it not necessary for civilians throughout the country—outside of the army altogether? Normal recreation, good reading matter, etc., are recognised in the army as preventives, in that they occupy soldiers' time in a normal way. If organised measures of this sort are desirable in the army are they not desirable outside of the army? If the lonely boarding-house, and the miserable, starved life, which many of our people live in their semi-slums are a factor in the production of immorality, is there not an opportunity there for us? There is such a thing as a model boarding-house for girls, with a common room, where a young girl may receive her young men friends. Would such buildings multiplied throughout the country be useful? Could any of our national organisations erect them? Would they be preferable to the shabby downtown building, where, not infrequently, the young girl—a clerk, a factory worker, or what not, receives her young man friend in her bedroom? The dance hall has been found to be a focus of immorality and infection. Why should mixed dancing not be permitted in our schools or even in our parish houses or church halls, in the evening—properly organised and supervised of course? Is it not time for us to recognise that dancing is, under proper conditions, a normal, healthy recreation for our young people? The feeble-minded question is another causal factor, to which too little attention has been paid. There should be some method of ascertaining the mental status of each woman arrested on a charge of prostitution. Again, actual ignorance of the sex function, of its sacredness, and of the dangers of venereal disease are so common as to be an actual danger. Again and again have I heard the wail, by young men who have been infected, "Had I only known what I was doing." Children should know something of sex, and their parents should teach them. At least some organised effort should be made to give parents the information which will make them useful teachers. There is much valuable literature already available. Because venereal diseases, altogether aside from the humanitarian aspect of the question, are a distinct factor in the production of inefficiency among workers, and hinder production (for instance, the production of shells or ships), some steps should be taken to interest manufacturers throughout the country.

I have been impressed by the fact that in the past there has been something wrong with our point of view on the whole matter.

Immorality is largely the fault of the community in which it exists. If a community does not provide the possibility of normal social life, abnormal life will follow inevitably. Venereal diseases, with their harvest of misery and death, are the direct result of the fact that we do not pay sufficient attention to the welfare of our young men and women. Our selfship in the past must develop into citizenship. We must remember that each individual in the community is an asset to us: that no nation can be strong if its citizens are weak and diseased. Bearing this in mind, there is no reason why the venereal disease problem should not give us a magnificent opportunity, not only for stamping out venereal disease, but for making this Canada of ours a better place in which to live.

PUBLIC HEALTH SERVICE IN SMALL TOWNS AND RURAL MUNICIPALITIES

J. J. Harper, M.D., Alliston, Ont.

In the past most of us who represent the smaller towns and municipalities can readily accord to the officers of the larger centres a more active and useful public service than we claim for ourselves. Various reasons are obvious in explanation. In city and large town life the daily press has had access to nearly every home. This has been a great educator. Whole time officers have better opportunities for educating their public. Lectures and instruction to the public, and to school children, have been resorted to regularly. The periodical advice from provincial boards has been easier to disseminate, and, therefore, better absorbed in the larger fields. However, methods are changing. The activity of our present provincial board has been so wholesome and practical that the fountain source of our information and support deserves much credit, as I believe it already holds the united respect and faithful fealty of all our officers.

Rural mail delivery is now so common in our counties that we cannot claim immunity for ignorance. Scarcely a home in the better parts but has at least one daily paper. The result is that the public is quite liable to get abreast of the M.O.H. if he is not an enthusiast. The public is wiser than we sometimes credit. I think, even now, we only need aggression ourselves to secure any public aid we desire. Assuming this as a correct attitude for our officers, I would say continue always to educate where most good will follow, by talks to public school classes, instructions to scout classes, lectures to first aid and social improvement clubs. Take an active interest in all local improvements in conjunction with park committees and town property officials, in order that the principles of municipal planning, which you may have gleaned from literature at your disposal, may be brought to their aid. We have often, as a body, been at least careless, if not negligent, in this regard. Clean streets and sidewalks and boulevards should be insisted upon. Notices should be erected forbidding expectoration on sidewalks. Caretakers of churches, schools and assembly halls should be advised as to best methods of ventilation. Milk supplies should be examined occasionally, and dairy establishments inspected at intervals, to encourage and enforce watchful, cleanly habits on the part of dealers. The bottle system should be insisted on for delivery.

The same casual examination of sources of meat and food supplies give good results. Warning, sufficiently forceful, should be given all grocers and provision merchants whose premises invite flies. Greater watchfulness is necessary where families live in rear or over the premises. You should always be ready to vouch for the water supply, if a system is installed. Where you depend upon wells, you should be ever ready to apply a few home tests so as to assure a good, potable domestic service.

An order, through the schools about Easter holidays, requiring proof of vaccination, would soon result in educating all to the wisdom for strict conformance to this health command. If the M.O.H. and confrères honestly did their duties we should never have severe epidemics of diphtheria. All cases of suspicious sore throat, of a dark red or purple shade, with or without glandular enlargement, should, if accompanied by rapid heart, be given the initial dose of antitoxin. The advised activity of the provincial board in placing antitoxin on the free list, has removed all cause for negligence in this matter on our part. We hope the promised manufacture and distribution of vaccines and serums already well begun shall continue until it becomes the very great success we bespeak for its adoption. Scarlet fever, likewise, should never become rampant in any rural locality if wisely controlled. While we have no specific treatment, as in diphtheria, we can usually isolate and carefully guard against spread better than can be done in the larger centres, for reasons of which you are well aware. Extreme care must be given to disinfection after scarlet fever, probably more so than any other disease, and demands the advice of the M.O.H. As far as can be determined at present, measles will continue in epidemics. I have always doubted the utility of quarantine in measles; but, since strict honesty and exact diagnosis between measles and scarlet fever is rather utopian, it is probably better to quarantine all rather than let a few cases of scarlet fever unguarded do untold harm.

We pass by chickenpox and mumps, as offering no special difficulty. With every increase in our experience with incipient phthisis, we are more convinced of the many cures occurring. Let us not think we have done our whole duty when we have given advice for the protection of other inmates in the home. If it is not desirable or practicable to remove to a sanitarium, where the patient would get the one best chance for recovery, then diet advice should be given. Unforgetable emphasis should be laid on mastication and deep breathing exercises.

PUBLIC HEALTH PROGRESS IN ONTARIO

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Chief Officer of Health, Ontario.

The following is a synopsis of an act recently passed by the legislature of the Province of Ontario, with the purpose of controlling venereal diseases.

The act provides that any person under arrest may, if the medical officer of health believes that the person is infected with venereal disease, be required to undergo an examination, in order to ascertain if he is or is not infected with this disease, which, by the act, includes gonorrhœa, syphilis and chancroid. If the person so examined is found to be infected, he may be detained and treated. Physicians in medical charge of gaols, and other places of detention, are required to report, within twenty-four hours, any persons confined who may be found to be infected.

If a medical officer of health has credible information that any person is suffering from venereal disease the officer may require such person to be examined, and if the person is infected, the officer may take steps requiring satisfactory treatment.

In order to prevent unjust action against a physician who makes an examination or report in respect to such cases, it is provided that such action can only be brought with the consent of the provincial board of health.

Provision is made for right of entry to a house or premises by the medical officer of health, or his deputy, in the day time, for the purpose of enquiry, or examination, in respect to such cases. This provision is identical with the one in force in respect to other communicable diseases.

Hospitals designated by the board are required to provide facilities for treatment.

No one but a legally qualified physician is allowed to attend upon, or prescribe for, or supply, or offer to supply, any drug, medicine, appliance or treatment to or for, a person suffering from venereal disease, or for the purpose of the alleviation or cure of such disease: the only exception to this being that a qualified chemist may fill the prescription of a physician for such purposes. The penalty for infringement of this provision is $100 to $500. A similar penalty is provided against advertising in a newspaper, pamphlet or other

periodical, any remedy or cure for these diseases. This penalty is also provided for anyone knowingly infecting any person with venereal disease.

Anyone making statements to the effect that a person has one or other of these diseases, except in case of disclosures made in good faith to a medical officer of health, or physician in consultation, is liable to a penalty of $200.

Provision is made with the object of maintaining secrecy in respect to cases of this nature by those who have the administration of the act.

The most important feature of the bill lies, however, in the powers given the provincial board to make regulations in regard to the *forms* and *notices* to be used in the administration of the act; in regard to the *remedies* to be used; respecting the *course of conduct* of the patient; in respect to the *distribution of information* concerning these diseases; the *regulation of treatment* in hospitals, etc., for *preventing* infection; for *reporting of cases* by serial number; of *notices and placards* in public places; *imposing penalties* for infringement of regulations; *procedure in appeals,* which may be made, as a finality, to the board; and the *method and extent of examination* of persons.

The board is given power to manufacture and distribute remedies free, or otherwise, to local boards of health, physicians and hospitals.

Any expense in carrying out the provisions of the act may be incurred by the medical officer of health, or local board, and such expense must be met by the municipality. The regulations under the act are now in course of preparation, and the law goes into effect on the 1st of July, 1918.

While the effect of this law, which is a fairly drastic one, can scarcely be foreseen, it is reasonable to regard it as a decided step in advance. The restriction of practice in these diseases to qualified physicians, and the prohibition of the advertising of quack remedies, will, it is hoped, do much to eliminate the baneful effects of treatment by druggists and quacks, who not only do no good, but, usually, do a lasting injury to the victims of these diseases, not only by leaving them uncured, but, in addition, by giving them a false sense of security, which allows of the transmission of disease to innocent parties. Reporting of the names of those infected, which does not seem to have worked well in practice elsewhere, is not sanctioned by the act, but reporting by number is required.

Amendments to The Public Health Act

Bill No. 139, 1918

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be cited as The Public Health Amendment Act, 1918.

2. Every district officer of health shall be paid such salary as may be fixed by the Lieutenant-Governor in Council, and his actual and necessary travelling and other expenses incurred in the discharge of his duties, and such salary and expenses shall be payable out of such sums as may be appropriated by the Legislature for that purpose.

3. Subsection 2 of section 25 of The Public Health Act is amended by striking out the words "five per centum" in the seventh line thereof, and by substituting therefor the words "at a rate not exceeding six per centum."

4. Section 29 of The Public Health Act is amended by striking out the words "cleansing and" and the words "cleanse and" in the sixth line, and by adding thereto the following subsection:

(2) The disinfecting, renovating and cleansing of houses and premises shall be carried on in accordance with the regulations.

5. (1) Section 32*a* of The Public Health Act, as enacted by the Act passed in the 7th year of His Majesty's reign, chapter 51, is amended by adding after the word "public," at the end of the third line, the words "and separate."

(2) The amendment made by subsection 1 shall have effect and be deemed to have been in force as from the 12th day of April, 1917.

6. Section 41 of The Public Health Act is amended by adding thereto the following as subsection 2:

(2) When the Medical Officer of Health is absent from the province for a protracted period the council may, with the written approval of the Provincial Board, appoint a legally qualified medical practitioner to be Acting Medical Officer of Health during such absence, and such Acting Medical Officer of Health shall have, during the absence of the Medical Officer of Health, all the powers, and perform all the duties of the Medical Officer of Health.

7. The Public Health Act is amended by adding thereto the following section:

52*a*. (1) Where a medical officer of health claims that the salary paid to him by a municipal corporation or the remuneration provided for under section 52 is not fair and reasonable, and gives notice of such claim in writing, signed by him, to the clerk of the municipal corpora-

tion, and the council of the corporation neglects to comply with such demand, or directs the serving upon the medical officer of health of a notice disputing such a claim, the medical officer of health, after the expiration of ten days from the receipt of such claim by the clerk of such corporation, may apply in a summary manner to the judge of the county or district court of the county or district within which the municipality lies, for an order allowing his claim and fixing the amount payable to him as salary under section 39 or as remuneration under section 52, and upon such application the judge shall hear the parties and their witnesses and shall make such order as he may deem just, and in and by such order shall settle and determine the salary properly payable to such medical officer of health, and a fair and reasonable remuneration under section 52.

(2) If such application is not made by the medical officer of health within thirty days after receiving notice from the corporation disputing his claim, he shall be deemed to have abandoned the same.

(3) The judge, upon the application, shall take into consideration all the circumstances of the case, and amongst other matters the physical extent, population and assessment of the municipality.

(4) The Judges' Orders Enforcement Act shall apply to every application or order made under this section.

8. Section 54 of The Public Health Act is amended by adding after the word "from" at the end of the second line the words "or exposed to," and by adding thereto the following subsections:

(2) Every person in a house when a communicable disease exists therein, and every person who during the period of quarantine enters such house, shall be deemed to be exposed to the disease.

(3) It shall be the duty of every physician, medical officer of health, superintendent of a hospital, nurse, midwife, and everyone in charge of a maternity hospital, every householder, and everyone in charge of a child, to see that such requirements as may be prescribed by this Act or by the regulations are duly complied with in respect of ophthalmia neonatorum, trachoma, inflammation of the eyes of the newborn, or other communicable disease of the eyes.

9. Section 92 of The Public Health Act is amended by striking out the word "and" at the beginning of the second line thereof and by adding after the word "corporation" in the second line the words "and any person" and by striking out the words "or officer" in the tenth line and substituting therefor the words "officer or other person."

10. Section 94 of The Public Health Act as amended by section 47 of The Statute Law Amendment Act, 1914, is further amended by adding thereto the following subsections:

(9) The Provincial Board may withdraw, amend or vary any approval given by it under this section or any order or certificate made by it, and may approve of a different or other system of sewerage, sewage disposal or sewage disposal plant, or a different or other location of the same.

(10) Before acting under the provisions of subsection 9 the Board shall notify the clerk of the township municipality in which the system of sewerage is located or into or through which it is continued or in which it is proposed to locate the system of sewerage, or into or through which it is proposed to continue the same, or in which it is proposed to locate a sewage disposal plant, and the Board shall hear and consider any objections which the council of the township or any resident therein may make to the erection of the said work or any part thereof.

(11) Where the Provincial Board has made an order or report under the provisions of subsections 7 to 10, the corporation of the urban municipality before proceeding with the work, shall apply to the Ontario Railway and Municipal Board, for an order prescribing the manner in which such work may be carried on, and notice of such application shall be given to the township municipality and to any resident therein whose property is, or may be, affected by the proposed works.

(12) Upon such application the Ontario Railway and Municipal Board may make an order;

(*a*) Stopping up and closing any highway, road or road allowance, temporarily or permanently for the purpose of allowing the proposed work to be carried on; and vesting the same in the urban corporation, and providing for the opening of other roads, highways and road allowances for the use and convenience of the residents of the township municipality in lieu of the roads, highways and road allowances so stopped up and closed, and the provisions of section 86 of The Registry Act shall not apply;

(*b*) imposing such terms and conditions upon the urban municipality with respect to the construction and operation of the proposed works as the Board may deem just;

(*c*) ordering that any buildings, restrictions, covenants running with the land or any limitations placed upon the estate or interest of any person or corporation, in any lands in or through which it is proposed that a sewage disposal system may be constructed or continued, or where the site of the sewage disposal plant is proposed to be located, shall be terminated and shall be no longer operative or binding upon or against any person or persons, and direct that any such order be registered under the provisions of The Registry Act;

(*d*) fixing the compensation to be paid for lands taken or injured in the construction of such works.

(13) The registration of any order under clause *c* of subsection 12, shall be a bar to any action or proceeding taken by any person or corporation claiming any right or benefits under or by reason of any such restrictions, covenants, interests, estate or title in the lands described in the order.

(14 The Ontario Railway and Municipal Board shall have jurisdiction to enquire into, and hear and determine any application by or on behalf of any person or corporation interested complaining that any urban municipality constructing, maintaining or operating any sewage disposal system, or plant, or having the control thereof:

(*a*) has failed to do any act, matter or thing required to be done by an Act or regulation, order or direction, or by any agreement entered into by the corporation; or

(*b*) has done or is doing any act or is failing to do any act and that such act or failure is causing depreciation, loss, injury or damage to any property of any owner, and the said Board may make any order, award, or finding in respect of any claim of damage or injury, as it may deem just.

(15) The jurisdiction of The Ontario Railway and Municipal Board under this section shall be conclusive and all claims for injury or damages or any other matter arising under the provisions of this section relating to the construction by an urban municipality of a sewage disposal plant in a township municipality, shall be heard and determined by the Board and The Ontario Railway and Municipal Board Act, so far as it is practicable, shall apply to every application and order made to or by the Ontario Railway and Municipal Board under this section.

11. Subsection 2 of section 110 of the said Act is amended by striking out the figures "$20" in the eighth line thereof, and substituting therefor the figures "$500."

VENEREAL DISEASES AS COMMUNICABLE DISEASES

MAURICE M. SEYMOUR, M.D.

D.P.H. for Province of Saskatchewan.

In 1915, it was estimated that in one European army a number of soldiers equal to sixty divisions was ineffective on account of venereal diseases, and the fact that 30,000 men have already been found to be suffering from veneral diseases in the United States army, so recently entering the war, is sufficient demonstration that the problem is one deserving of immediate and serious attention.

Investigation has proved that a large proportion of venereal infections occur before enlistment, and that, therefore, the incidence among the civil population is very high. In the army, methods of controlling infection under strict discipline can be made efficacious in reducing the incidence; but, unfortunately, in civil life the problem is much more difficult to deal with. The public is now, however, awakening to the seriousness of this great civilian problem, and all public bodies are concerning themselves with regard to ways and means.

The lack of authentic information on the prevalence of these diseases has been found to be a great obstacle in the study of the problem.

In the words of Dr. Gordon Bates, who discovered, when attempting to get statistics, that 12% of patients in general wards in Toronto General Hospital gave a positive Wassermann reaction—

"One cannot but feel that in regard to these subjects, we are hampered by our ignorance of both their extent and seriousness. I am unable to find any extensive Canadian statistics as to the prevalence of prostitution, and only lately has the work of a few investigators, using the Wassermann reaction, given us the idea that in dealing with venereal diseases we are attempting to solve a problem of extreme gravity."

The necessity for measures for reducing the incidence in civil life is therefore apparent.

Syphilis.

Syphilis is a specific communicable disease, caused by a definite organism called "spirochæta pallida" or "treponema pallidum."

The disease is conveyed from an infected to a healthy person by actual contact, through the means of infected objects, or it may be

transmitted to offspring through one or both parents, when it is known as "hereditary syphilis."

Syphilis runs a chronic course of indefinite duration; its manifestations, although following a more or less regular order, are intermittent in character and consist of numerous symptoms or lesions, which may, under different forms and degrees of gravity, affect any tissue or part of the body.

Ætiology

Shaudinn, in collaboration with Hoffmann, made the very important announcement, in 1905, of the discovery of a spiral organism, which they had constantly found in syphilitic lesions, and which, from its pale appearance, low refraction and spiral shape, was named the "spirochæta pallida," and, later, the "treponema pallidum."

The standard association of the spirochæta pallida with syphilitic manifestations led to its being generally accepted as the specific cause of the disease; but proof of this fact, has since been supplied by Noguchi, who, in 1911 and 1912, succeeded in obtaining pure cultures of the treponema pallidum, which, when inoculated into experimental rabbits, produced in due time lesions characteristic of syphilis, and containing numerous treponema. Inoculation of cultures in monkeys, was also followed by a local manifestations presenting the appearance of the initial sores in man, by using material of human origin. Additional evidence was procured by the blood of monkeys, giving a positive Wassermann reaction, which had been inoculated with pure cultures obtained from human lesions, thus demonstrating the relations of the treponema pallidum to the serum tests, and, also, to the similar character presented by the cultivated strains with the species existing in the human syphilitic lesions.

The majority of authorities class the treponema among the protosoa.

The treponema pallidum is a fine, tenuous, spiral organism, varying from ten to twenty-six microns in length, and of almost immeasurable thickness—one-quarter to one-half micron; it presents a number of deep, well accentuated, regular spirals, and finely pointed extremities; it moves to and fro by rotation on its axis and retains its spiral form while in motion. It requires to be differentiated from:

The spirochæta refringens;

Spirochæta micro-dentium;

Spirochæta macro-dentum, and

The spirochæta buccalis.

The treponema pallidum has been found in practically all the lesions of acquired syphilis, and in all its stages. It is most abundant

in the primary sore, and is also found in the lesions in secondary stage, although with more difficulty; it is present in the blood and lymphatics; it is found in the organic lesions of the tertiary stage, notably in aortitis, as well as in gummata, tabes and paresis. It is present in the lesions of early and late hereditary syphilis, being especially abundant in the organic lesions of children dying of congenital syphilis, particularly in the liver.

The presence of the organism in the initial sore, establishes, without any doubt, the diagnosis of syphilis, and indicates the need of immediate specific treatment, without having to wait, as formerly, for the appearance of the secondary symptoms. Hoffmann's method of aspirating an enlarged gland in the groin or elsewhere is a convenient method, when the treponema cannot be demonstrated in the ordinary lesions.

The life of the treponema pallidum is not yet determined. The work of MacDonagh (*Lancet,* October, 1912), and Ross (*Br. Medical Journal,* December 14th, 1912), show that the spirochetal form of the parasite is but a single stage in the development of the organism, and that, apparently, the cycle begins with the entrance of granular or spore-like bodies into mononuclear cells. From these granules (termed inclusion bodies, by Ross) short, wavy, filamental processes develop, which ultimately grow into spirochaetæ. Noguchi has also observed granules in cultures from which the same filamental bodies develop.

MacDonagh believes infection is probably conveyed by these sporozoites, or infected granules, and not in the spirochetal stage. This seems to be confirmed by the period of incubation required after the infection, during which time the parasite undergoes its development. It would further explain the failure of salvarsan or mercury to completely sterilize the infected individual, although both are fatal to the spirochætal form; and also the recurrences and later manifestations of the disease, resulting from the subsequent development of these resistant spores or spirochætæ granules. The presence of these resistant granules may also account for some examples of contagion from infected objects, because the spirochætæ themselves are extremely delicate, anærobic organisms, that do not survive desiccation.

Pathology.

Syphilitic lesions consist essentially of an inflammatory hyperplasia. In the skin the lesions vary in degree from a slight, scarcely appreciable, macular swelling, to that of the tubercular eruptions, in which the entire thickness of the skin is involved in all syphilitic

lesions. The walls of the blood vessels are the seat of inflammatory changes, in the infiltrative process which usually surrounds the vessel. The changes which take place in the syphilitic lesions may terminate in three different ways:

1. The infiltration may undergo complete absorption, leaving no traces, or only very insignificant ones.

2. It may undergo a fibrous organisation or sclerosis.

3. It may undergo a gummatous or caseous change, ending in necrobiosis.

The first termination occurs in the lesions of the first and second stages. The two last endings belong to the tertiary stage, and constitute the gummatous and sclerotic processes, both of which are often associated or combined. The most serious lesions of syphilis are those connected with blood vessels.

Primary Stage.

In acquired syphilis (by far the most common) the initial lesion or sore always develops at the point of contagion, and is accompanied with more or less pronounced enlargement of the neighbouring glands. The period of incubation may be from fifteen to forty days; but most commonly the initial sore appears from the twenty-first to twenty-sixth day following exposure. The appearance of the secondary, or constitutional symptoms, takes place, as a rule, from forty to forty-five days after the appearance of the chancre. While the primary stage is limited to the local sore, the manifestations of the secondary period are represented by many and scattered symptoms and lesions, varying in character and degree, and consisting of eruptions on the skin, erosions and ulcerations of mucous membranes, falling of hair, enlargement of glands, affections of the nails, muscles, periosteum, bones, and of the special organs.

Tertiary Stage.

There is a certain degree of regularity followed by the primary and secondary periods, that cannot be said of the third stage, which justifies the remark of Fournier, "When does it begin and when does it end?" The tubercular and gummatous manifestations are peculiar to the third stage. The duration of the third stage is indefinite; its symptoms may appear during the first year or few months of the disease, or they may not appear for five, ten, twenty, and even as late as fifty years, or more, after the disease is contracted.

The tertiary stage is marked by the gravity of the manifestations, as well as their destructive tendency.

It is extremely important that a diagnosis of the primary lesion be made (which can be done from the known period of incubation) from the objective characteristics, the hard swelling at the base, the enlargement of the glands in the neighbourhood, and the finding of the treponema pallidum.

The serological reaction is rarely positive before the second or third week. The differentiated diagnosis rests chiefly between herpes, the simple venereal ulcer or chancre, and, occasionally, the ecthymatous ulcerative lesions of scabies.

The demonstration of treponema establishes the diagnosis, and allows of the immediate beginning of treatment when it can be most effective in destroying the invading organisms, preventing or lessening the later symptoms, and greatly increasing the probability of an early cure.

Time will not permit my going into the details of treatment farther than to recommend that the treatment be continuous for a period of at least two years after the symptoms of the secondary stage have developed, and then the patient should be kept under observation for a further period of at least three years, in order to immediately deal with any further outbreak of the disease.

Gonorrhœa

Gonorrhœa is as old as mankind, and one of the scourges of humanity, which only recently has received little attention from the general public. While syphilis is recognised as a serious disease, gonorrhœa is often made light of, and one frequently hears reference made to it as being no worse than a bad cold. Notwithstanding the fact that gonorrhœa is very much more common than syphilis, as well as being the cause of endless misery among the innocent.

The complications and after effects are not sufficiently known by the public, notwithstanding that both from a social, and, individual point of view, they are just as serious as those of syphilis.

Until the beginning of the nineteenth century, the distinction between gonorrhœa and syphilis was not well known. To Albert Neisser belongs the credit, in 1879, of the discovery of the specific organism which is the cause of ocular and urethral gonorrhœa.

In the middle of the nineteenth century the abortive treatment was first made use of by Voillemier.

Gonorrhœa is contracted in only one way, that is, by contagion.

When a man has contracted an attack of gonorrhœa, sensations of pain and burning in his urethra soon make known to him the nature of his disease; but once the acute stage has passed off, he often under-

estimates the seriousness of his case. If, then, he neglects treatment, or postpones it, and finally fails to be cured, he soon forgets that he is a source of danger to others. If, while in this condition, he marries, he infects his wife; and, the absence of acute symptoms at this time, fails to warn the unfortunate young woman of the true nature of her illness, which so frequently ends in serious inflammatory conditions of the organs of generation, and ultimately in complete sterility.

Gonorrhœa is one of the most frequent causes of depopulation, as well as being responsible for wrecking the lives of so many men, and the cause of sterility in so many women.

It is the duty of the medical profession to educate the public as to the true nature of gonorrhœa, and the importance of having every case thoroughly cured.

It is obvious that one of the best means of combating these diseases is education of the public with regard to their nature and how they are spread; and, if young men can be made to realise the seriousness of these diseases, their disabling and injurious results, the majority of them will avoid infection.

Measures Adopted in Canada.

At the present time, the only provinces having legislation with regard to these diseases are Saskatchewan and Ontario, both of recent date.

The regulations of both provinces require that venereal diseases be reported, and that those suffering be placed under proper treatment.

The Saskatchewan regulations require all persons affected with venereal disease to report to a physician, and remain under treatment until a certificate of cure is granted. Physicians are required to report to the commissioner of public health all cases treated by them, by number only, except in cases where the patient should not report for treatment, for thirty days, when the name must be reported and treatment enforced.

In the event of the patient changing his physician, the second consulted must immediately notify the first physician that the patient is continuing treatment, and is under his care.

Physicians are supplied with circulars on venereal diseases, which they are required to hand to patients at the first examination, along with a copy of the regulations.

Provision is made that no person suffering from venereal disease shall be employed as barber, waiter, butcher, or teacher, or engage in any way in the handling or manufacture of food.

All reports are confidential, and secrecy is observed in dealing with the matter.

The pioneer country in this direction is Western Australia, where a bill for the control of venereal disease was passed in 1915.

This act and the amendments, which were found necessary in attempting to administer it, form a basis for Canadian legislation, as conditions in Canada are somewhat similar. In Australia the Commonwealth comes to the aid of the states, adopting these measures and agrees to subsidise them on £1-for-£1 basis up to £4,000 ($20,000.00) for the first year, and £2,000 ($10,000.00) subsequently, and this sum is expected to amount to half the expenditure. During 1916 free treatment and night clinics were established by the department of public health, and literature was prepared and issued with the object of educating the public.

Convictions were secured against unqualified persons treating venereal diseases. It was found difficult to organise the necessary treatment and accommodation for these diseases, as laid down in the act, but it was anticipated that by the end of 1917 the scheme would be complete and working in full swing.

The 1916 records were found to justify the legislation, and, for the last seven months of the year, 1,117 cases were notified as follows: 747 gonorrhœa, 320 syphilis, and 50 chancroid.

The high proportion of cases of syphilis would go to show that a large number of cases of gonorrhœa do not seek skilled attention. In the case of syphilis, of the 320 cases, only 47 occurred in females (that is, a proportion of 7 to 1), in the case of primary syphilis, there is only 1 female affected to 40 men; whereas in secondary syphilis, the proportion becomes 1 to 3.5. This would go to prove that in women the primary sore is often overlooked, and females missed in the primary stages constitute a grave danger.

Making venereal disease reportable is the first essential step towards reducing the number of these diseases. Provision should be made for early diagnosis, in order that treatment may be commenced without delay. Free treatment for those unable to pay should also be provided.

Modern science has made such progress, both in the treatment of syphilis and gonorrhœa, that it is possible to cure the former, and even the worst forms of urethral inflammation can now be cured by appropriate treatment.

The most efficient manner of dealing with, and reducing the danger from, venereal diseases as communicable diseases, is insistence on all cases remaining under treatment until cured.

SECTION VI

RETURNED SOLDIER PROBLEM

THE PREVENTION OF WAR NEUROSES

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GENTLEMEN,—Certain facts established by medical officers I desire to bring to your attention: The war neuroses do not occur in regiments under certain medical officers or line officers; nor do they occur in soldiers who have severe wounds or severe organic disease; nor in prisoners of war; nor in all of the soldiers exposed to shell explosions. Furthermore, these neuroses do not only occur in soldiers who have been in action, but also in soldiers who have not been overseas.

It is evident that running through these diverse conditions there are some factors which tend to prevent the development of neuroses. It is the purpose of this paper to discuss the factors which tend to avert neuroses, that they may be developed for the benefit of soldiers individually and collectively.

At first glance it would seem that the removal of prisoners from the zone of exploding shells would account for the absence of neuroses, but the evidence of like neuroses in soldiers who have never been overseas, or who have not been in action, indicates that distance from danger does not prevent their development. In other words, it is not necessary, first of all nor eventually, to stop the war in order to prevent neuroses.

Efforts on a large scale have been made in recent years for the elimination from armies of men whose constitution makes them unfit for service. Individuals who are insane, or who have ever been insane, psychopathic individuals, constitutional defectives, and men who for six months immediately prior to enlistment have been incapacitated from work because of a neurosis, are exempted from ser-

vice. Men who have chronic neuroses, and who have not been incapacitated six months prior to enlistment, although in previous years they may have been away from work for a great many months, are accepted for service. This systematic procedure keeps undesirables from getting into the army. There still remain the tasks of preventing the incapacitation of men who are already neurasthenics on admittance to service, and of preventing the development of neuroses in the average normal soldier and in the high-grade, intelligent officer, to both of whom there are so many opportunities after mobilisation for maladjustment.

Theoretically discipline tends to control men. Soldiers and officers are put through a training calculated to dominate them so completely that, even under stress of adverse circumstances, they would react in an habitual way. In other words, they are taught adjustments beneficial to service, but their training is directed more to their bodies than to their spirits. Military writers on the science of war have lamented the lack of definite instruction of officers and soldiers in the development of morale. The management of emotions has always been left to the individual line officer, who himself has had no formal instruction in dealing with the rise and fall of morale, either in individuals or in troops. As a result, soldiers and officers are carried along by routine or sheer force, and are treated by the system of reward or punishment according as they are contented or discontented, more intelligent or less intelligent, normal or neurotic; or in other words, according as their behaviour is a good adjustment or a maladjustment. Obviously army training and discipline were never intended to be directed particularly toward nervous soldiers, nor systematised to the end of preventing nervous breakdowns. Discipline actually compels adjustments rather than prevents maladjustments. A man must carry on until some excuse deemed sufficient incapacitates him, and the medical officer is consulted.

There are reasons for believing that there can be preventive measures on a large scale. Before Pearce Bailey's book on traumatic hysteria came out in 1898, there were a great many patients every year who claimed damages from railroads for functional nervous symptoms following railroad accidents (1). Through the agency of this book not only patients and doctors, but lawyers and the general public came to know that people were not entitled to functional nervous symptoms just because of accidents. Now traumatic hysteria is practically a thing of the past. War neuroses are but varieties of traumatic hysteria; if one form can be eradicated, so can another form.

(1) Pearce Bailey, M.D., *Accident and Injury:* New York, D. Appleton, 1898.

There is evidence immediately connected with the war. On their return from France, some Canadian soldiers and officers with whom I talked at length told me that they believed they would have avoided their symptoms of nervousness if they had only been told by some understanding person that the fear they experienced was nothing to be ashamed of, and had they been helped to regain their self-confidence or self-esteem. They stated that they thought there would be definite benefit to the army from straight talks to soldiers about fear.

A line officer returned to Canada after having spent many months at the front, on being asked about his experience with nervous symptoms in soldiers told me that he had heard of their existence in the army, but that none of his own soldiers had broken down; he considered that it would be a personal disgrace if soldiers broke down under his charge. C. B. Keenan, Lieut.-Colonel, C.A.M.C., told me that he believed that if soldiers were managed properly there was no need for them to be disabled with nervous symptoms.

There is a story of one of the clearing stations in France where the medical officer in charge said: "Hello, here are twenty cases of shell shock from the ——— regiment. We have not had any shell shock from that regiment for six or eight months. I wonder if they have changed medical officers?" On enquiring he found that the medical officer who had been in charge was away on furlough, and, that after a strange officer came on duty, there immediately developed these twenty cases of neuroses.

D. K. Henderson, Captain, R.A.M.C., was in New York this winter after having spent six months as battalion medical officer at the front, following an experience of ten months at the Lord Derby War Hospital in caring for large numbers of nervous soldiers. When I asked him about the difference in symptoms of cases when they got to England from those at the front, he said that it had been a great surprise to him, that not one of the men under him in the six months that he was a battalion medical officer developed a neurosis. He stated that he was on the lookout for these cases, as he was interested in them, but that although his soldiers were subjected to the same stimuli which the soldiers in the Lord Derby Hospital stated had incapacitated them, his soldiers had not broken down.

Not only is it theory that the war neuroses can be averted, but it is certainly fact that certain officers have actually avoided them. If measures on a small scale can be successful so can measures on a large scale.

Let us see now what is done by line officers and medical officers who avert incapacitating neuroses. First of all they carry

out the army regulations existing in all countries directing them to look out for the welfare of their men. They look after the physical comfort of their men by arranging for food, blankets, smokes and rest, and make the soldiers feel that they are really interested in their well-being. They consider their troops to be made up of individuals, and, in their personal contact with them, discriminate between different kinds of men, using judgment in dealing with them. Some captains make a point of being able to call privates by their nicknames and of knowing their family stories. Most of the higher officers consider it an impossibility to know intimately every private, but they expect the lieutenants, and particularly the sergeants, to have a pretty careful knowledge of every private. In this way they make subordinates feel that they are considered as individuals, and not as mere cogs in a machine. These officers know, too, that privates and stretcher bearers are connoisseurs not only of officers' leadership, but also of the morale of individuals. They find that bets are made as to which men are going to break down, and just how soon these particular men will be sent back of the line with the so-called shell shock. This knowledge gleaned as it is from more or less inaccurate and unscientific sources is nevertheless valuable enough, they consider, to be investigated. An officer then has the opportunity of passing down the line to make observations for himself or of summoning the candidate.

The line officer, rather than the medical officer, has the first opportunity for this first aid to a man whose behaviour is noticed to be different than usual. It is necessary, first of all, to tide this man over his immediate stress, and later to relieve him altogether of his discomfort. The soldier is ordered to fill sandbags or to do even unnecessary work that has been devised for the occasion. If work alone isn't sufficient to steady his nerves, he is placed between two veterans, who are instructed to look out for him, or he is kept in tow by the line officer himself. One officer told me that he did not allow a certain nervous soldier out of his reach for several days until the fellow was steady enough to manage himself alone. Keeping a man busy is but a mechanical means of transforming his emotions from one kind to another; talking to a man is another means. It does not matter what means are used provided the reaction proves progressive rather than regressive.

An officer criticises a trembling soldier for some trivial fault thereby inducing shame, anger, or a desire to make amends. He goes down the line chatting casually with a nervous soldier, discussing affairs at home, until in a twinkling the soldier recovers his self-possession. To a man who has tears in his eyes he gets off a joke that

produces a hearty laugh. To the next soldier, who is hesitating about going over the top, he gives an unexpected jab with his bayonet, causing the soldier to let out an angry curse until he turns around surprised to find the officer there. This anger which superseded the hesitation is quickly replaced by chagrin, and then by a desire to make good in the eyes of his beloved officer. This officer goes on down the line. He shouts to a surly chap, "Why the hell don't you get on your job?" and in the next breath, he whispers to another, "I'm scared, too, but I'm not going to quit, are you?" Now he comes upon a soldier just excavated from a heap of dirt following a shell explosion. He looks at the man on the ground; no medical officer is near, so he quickly manipulates the arms and legs and finds that no bones are broken and that there is no oozing blood. He helps the soldier to his feet and says, "Well, old top, they didn't get you after all. You'll be all right in two minutes. I say, Tommy," addressing the nearest man, "you get busy fixing this trench, and have this fellow help you."

If at the end of the day the officer hears that one of these men is still unsteady, he hunts him out or sends for him and demands, gently or abruptly, as is best suited to the soldier, "Come now, tell me, what is it that is *really* troubling you?" And then he gets the story that something has gone wrong at home, that he is discontented with trench life, is afraid, or is fed up with the whole show. Patiently the officer listens, and talks in a way that is not too fatherly, too friendly, nor too authoritative, until the soldier leaves calmed, ready for the future. The officer goes to sleep feeling not only that he has steadied the soldier, but that by preventing the soldier's collapse, he has saved his own reputation from disgrace.

No person is ever subjected to such an unleashing of primitive emotions as is a man in the service, and if ever one needs help in managing his emotions it is in time of war. The brunt of the management of soldiers falls to the line officers, and that of the officers to higher officers, but that part which relates to the health naturally should and does revert to the medical officer. Soldiers are more open to suggestion and are more likely to be impressed by the advice of the medical officer than are civilians, because men in uniform are trained to the habit of accepting without question the statements of those in authority.

Soldiers know, too, from their experience in earlier life, that a physician comes into a personal rather than a business relationship with them, and they prefer, when their emotions are upset, to deal with a medical officer rather than with a line officer. They expect a physician to understand their mental as well as their physical ailments.

Now a medical officer does not actually come in as close contact with troops as a line officer, and yet the troops all know him and what he stands for. Soldiers find out very quickly whether the medical officer is going to treat them as human beings, or is going to assume *a priori* that all soldiers are "swinging the lead." They know from the talk that is disseminated by soldiers who have been on sick parade, whether they can trust a medical officer with their personal difficulties.

Some medical officers realise the situation. They know that they cannot talk to each soldier separately, but they also know that the morale of the troops may be the morale of the neurotic soldier who comes in complaining at sick parade, and they take particular pains to keep that neurotic contented at his post. They know that the neurotic is the soldier who spreads talk, and that good advice given him is going to reach many others. In addition, some medical officers have a system of talking to line officers, non-commissioned officers, and, particularly to ringleaders among the privates, about the relationship of emotions to health, in order that they may in their conversations with others use his authority as physician in giving out this information. For as Napoleon said, it is not just before battle, but at the campfires, that there can be the greatest effect of a speech to soldiers.

The information that writers on military science say is necessary for the development of morale can perhaps be supplied by the medical officer in his instructions about the control of the emotions and their relationship to health.

With the idea of preventing soldiers and officers from breaking down with neuroses, the medical officer can discuss their management under two main heads—discipline and education. Discipline implies the domination of an individual. When a superior does not acquire the domination of an inferior he uses added force, severity, threat or punishment until the inferior is seasoned to taste. As the neurotic individual *ipso facto* submits to discipline less satisfactorily than a normal person, the superior increases his force, severity, threats and even punishment, expecting to get the desired results. The medical officer can explain that although this method may tide a nervous soldier over some immediate stress, it can but serve to aggravate the soldier's nervousness, and will, if repeated, be likely to precipitate a complete breakdown. Discipline is so indispensable to success that it cannot be relaxed for the sake of the candidate for nervous collapse. However, without the use of severe measures, the soldier can be brought to the point of believing that discipline is a form of coöperation between officers and men, to which he willingly lends his aid until there is perfect teamwork. This point of view can be acquired by process of education.

The second method is by training the mental faculties. The training of the body for military tactics, as regulated by the army, is alone insufficient for the prevention of neuroses. Mental training should go along with physical training in order that soldiers and officers can be as prepared to deal with the emotional as with the physical side of military life. Just as the education of the soldier includes the expectation of being in battle, or of having wet feet, so can it include the expectation of being in situations which will arouse hatred, anger, jealousy, sexual feelings, and, strongest and worst of all, fear. They can be taught to expect strong instincts and emotions to which they will not have a chance to react in the appropriate way. With this advance training they will not be caught unawares and unprepared.

They can be prepared to be harassed by the Hun until the fighting instinct arouses them to anger or hatred, and yet not be allowed because of military orders, to react to the emotion by fighting. They can be prepared to be in situations in which a creative instinct or a parental instinct arouses them to keen desire to take individual courses of action intended for the welfare of others and the State, and yet not be allowed because of military orders to be more than a cog in the machine. Soldiers can be prepared to expect strong sexual emotions when military orders interfere with the getting of gratification.

Soldiers can be told that accompanying any strong emotion regardless of its nature are symptoms of one kind or another, such as the rapid beating of the heart; jerky breathing; a change in the blood supply, such as paleness or flushing of the skin; perspiration; feeling of fainting and of weakness in the head, abdomen, or in the legs; trembling; an increased desire to pass urine and fæces, or even loss of control of those functions. The presence of any or all of these symptoms does not at all mean that the soldier has any organic disease. The soldier with strong emotions is entitled to symptoms, and need not be alarmed about his physical state if he finds that his heart thumps, or that he loses control of his bowel movements just as he is about to go over the top. When a person fully realises that there is no relation of the symptoms of emotions to the symptoms of organic disease he no longer worries about himself.

It often happens that soldiers obtain satisfaction through some other instinct than the one that is aroused, as for instance, his fear leaves him altogether when he is given responsibilities, increased when he comes into hand-to-hand conflict with the enemy, when he is diverted by football or other sports.

Soldiers can be taught to anticipate having their personal tendencies or desires frustrated by military orders; and they can be taught, too,

that the advantages to the State of having a perfect discipline are also advantages to the soldiers themselves, in giving them a protection which they could not have if they yielded to their own impulses. Soldiers can be made to understand that sacrifice of their personal desires is in reality not a curtailment of their getting satisfaction out of life but the best means of preserving their own lives under conditions of war.

When military orders interfere with the obtaining of satisfaction of emotions once started, and appropriate responses cannot be given to them, attempts to suppress them only serve to aggravate the symptoms, as in the case of a man whose symptoms become increased when he cannot extricate himself from danger and tries to hide his fear. Any emotion ought to be recognised and dealt with rather than suppressed, particularly if it is repugnant to or incompatible with one's ideals. Frequently difficulties arising in soldiers and especially in officers are due to the fact that the expression of fear is repugnant to the ideals of patriotism and duty. Fear in a man urges him to get out of danger, and his ideals tell him to be steadfast and worthy of the name of good soldier. Fear makes a man say to himself, "God, I'd like to get out of this," and at the same time his ideals for patriotism and duty say, "Steady, old man, carry on." A war between fear and ideals is carried on inside the soldier until he, ashamed of himself because he does not possess that bravery which he thinks should be the first quality of a soldier, considers himself an inferior creature, and suddenly finds himself in the midst of a neurosis.

The medical officer can give assurance that fear is a normal, healthy reaction to the presence of danger when one cannot get away; that fear may be a matter of good judgment; that fear comes to every man at some time or other, except to the insane man; and that fear may be acknowledged openly and frankly without any more shame of criticism than one would have in talking of anger or hatred. Soldiers suffering from war neuroses, with whom I have talked, all expressed the greatest relief when they found that they could discuss their fear without being criticised or made to feel ashamed of themselves, and they told me that they believed every man would be a better soldier if he could go through his experience with fear, and come out of it without feeling remorse and shame. If soldiers can be relieved of their self-reproaches for having fear, they will no longer have that conflict in their minds which is the forerunner of a neurosis.

Another point in the education of men in service is in connexion with the instinct of self-preservation. Although men with fear are not taken out of danger, men with neuroses are. A neurosis is an

agent which brings a man back of the line. Just as soldiers are glad to have "blighties" in order to get to a place of safety, so soldiers are glad to have neuroses to get to a place of safety. Despite the disadvantages of suffering, there is a distinct asset in having a war neurosis in that it keeps one out of the danger zone. The open discussion of this phase of the sickness will tend toward the elimination of neuroses, and it will also tend toward the open discussion of the relation of fear to ideals, so that soldiers and officers will all realise that the existence of fear need not interfere with one's being patriotic or fulfilling duty.

All soldiers need to have help at some time or other in keeping up their confidence. Soldiers like to have constant assurance that their superior officers, the mates of their own rank, their subordinates and the civilians at home are each and every one imbued with the idea of doing their bits well and conscientiously. Then they feel confidence in others. More than confidence in others, soldiers need to have self-confidence. And only when soldiers feel their own ability to cope with the problems that reach them from home, with those that come up in military life, and with their own emotions, do they feel confidence in themselves. Lack of self-esteem is one of the worst enemies of an individual. It develops from so many causes that intelligent help from an unprejudiced officer is necessary to remove it. The development of self-confidence is necessary to the good morale of the individual; the absence of self-confidence is a symptom of a neurosis.

A soldier always recognises in his officer a willingness to help. He quickly knows which line officers and which medical officers feel a personal responsibility for the safety, comfort and health of their men. Similarly officers are quick to sense a feeling of responsibility on the part of subordinates for their share in the "big show," and medical officers recognise the coöperation of soldiers and line officers in their participation in hygienic measures for general benefit. The complete training of officers and soldiers includes the development of a sense of joint responsibility in which the medical officer makes use of every prophylactic measure known to his science for the health of the soldiers, in which the line officer acts as both father and mother to his soldiers, and in which the soldier considers that his country's cause is his cause and his country's fight his fight. In other words, when there exists a feeling of joint responsibility, the individual disregards his own interests in favour of those of others. If each individual feels responsibility for others and for the cause, there will be a decreased liability to incapacitating emotions to neuroses.

SURGICAL OBSERVATIONS WITH ESPECIAL REFERENCE TO ORTHOPAEDICS

IRVING H. CAMERON, M.B., LL.D., F.R.C.S. (ENG.), F.R.C.S. (EDIN.), COLONEL C.A.M.C., C.E.F.

From the Symposium of the "Problem of the Returned Soldier."

For four and forty years I have been coming to these meetings, and in the early days Osler was secretary of the Canadian Medical Association, and, with his encouragement, I spoke much and oft, fuller of speech than thought, but "the years which make the stripling wise" were not slow to transmute with radiant energy the so-called silvern speech into golden silence. Johnson tells us of another unfortunate whose silence is commendable, as I have long felt mine to be, when he writes:

> "Superfluous lags the veteran on the stage,
> Till pitying nature signs the last release,
> And bids afflicted worth retire to peace!"

And so, Mr. President, I do not come here to-night *meâ sponte merâ,* to break the silence I have long preserved, but by command of my respected chief, the D. G. M. S., "to show his love and friendship to you," and in his name I give you greeting.

I see that I am set down to make some general surgical observations with special reference to orthopædics. What I wish to say upon this subject has been already recently and better said by Captain F. C. Kidner, of Detroit, in giving an account of the work being done at the orthopædic centre at Shepherd's Bush in London, with its eleven hundred beds and excellent equipment under the control of Sir Robert Jones, which account is published in the *Journal of the American Medical Association* in its issue of April 27th last. I shall therefore refer to it only in the briefest possible way, and then say, with your permission, a few words on a branch of the subject more directly germane to the symposium on the returned soldier problem. Possibly you will pardon me—and I shall make that assumption until called to order of the chair—if I make an allusion in the beginning to the word "orthopædic." And here, upon the "rim" I regret to find myself separated *dimidio caelo* from "the Hub," for the *American Orthopœdic Association Journal* (Boston), has, if I remember rightly, an indication on its front cover page, that they derive it from the two Greek words, ὀρφός = straight, and ποὺς= a foot. Now while this might do very well for the days of the small beginnings when tenotomy for club foot, and occasionally for contracted knee or hip or torticollis,

was the chief operative procedure in orthopædic surgery, when, later on, the other congenital or early acquired deformities of children, and particularly the tuberculous joint affections and paralysis of the extremities and spine were added, the ground became too large for the "foot" to cover and the root was shifted to παιδιχός = pertaining to a child and ὀρφόω = I set upright (one fallen), rebuild, restore. But in these days of "vaulting ambition," when the tail sets up to wag the dog, if the orthopædists want to chew what they have bitten off, they will have to adopt and make good *my* etymology of ὀρφως = rightly and παιδένω = I rear, educate, train or bring up. It is interesting to note, in passing, that Herodotus speaks of ξὺλινος πούς = a wooden or artificial foot; but, possibly, he refers only to a "peg leg," one of the best and most useful and least costly substitutes to be found.

Fifty years ago orthopædic surgery received an impulse of development by the advent of Sayre and the two Taylors (*pater et filius*) in New York, and Bayr in St. Louis, men of force and enthusiasm, and, as an old pupil of Lewis Sayre, I cannot forebear expressing regret at the extinction of the type of such strong and sturdy men and keen and forceful preceptors. On "the Continent" there were some strong exponents of the reviving spirit, and in England, Little of Bristol, and Adams, Barwell and Bampfield, Roth and Heather, Bigg and Howard Marsh in London, and Thomas of Liverpool were varied types of the chief masters of the art, but it was nothing more, lacking pathology, for the "palèd bust of Pallas." Minerva had not then cast either her light or her shadow on the handicraft. But the dawn was breaking.

These men, *et hoc genus omne,* were great surgeons too, and each contributed from his general experience some special ray of light upon the problems, and all had force and faith, merit and ability, but to America, I think, we must award the palm for the initial impulse which has transformed the scene and caused the litters of a corner of the field to usurp the whole; for what do we find to-day under Robert Jones's generalship and strategy? Listen to his "Classification of Orthopædic Cases" in the British army:

1. Bone lesions; ununited and malunited fractures.
2. Nerve injuries, complicated by fractures and contracted scars, including nerve suture.
3. Acute and chronic disabilities of joints, including ankylosis, and loose or fractured unar or other cartilages.
4. Injuries of muscles, ligaments and tendons, and stiffness of joints.
5. Deformities and disabilities of feet, such as hallux rigidus, hammer toes, metatarsalgia, painful heels, flat and claw feet.

6. Cases requiring tendon transplantation and other measures for relief in the irreparable damage of nerves.
7. Cases requiring surgical appliances. And in Canada, owing to our peculiar and advantageous conditions, Lieut.-Colonel Clarence Starr has contrived, and the D.G.M.S. has connived, to add an eighth including,
8. Amputations and stumps requiring trimming and fitting with artificial limbs.

On contemplation of this very formidable list it does not occur to one that the professors of capacity and ability to reëducate, rebuild and straighten out all these crookednesses and defects and deformities and to set the victims of them upright on their feet again can be suffering themselves in any wise from deficiency or defect in nerve or bony framework, particularly of the prognathous or malar regions; but, on the other hand, one must be convinced that they measure up pretty well to the standard of a man, capable of undertaking the work of a general surgeon.

And knowing both Colonel Robert Jones and Lieut.-Colonel Clarence Starr intimately and well, and recognising to the full the sufficiency and efficiency of each (*capax, perspicax, sagax* and *efficax* as each is) I am content that they and all whom they can bring up to their level should till the whole field that the handicraft of surgery can cover, with the aid of all the ancillary sciences combined with the arts and crafts which go to make the *mens sana* and the *manus medica*—the just judgment and the healing hand.

The article of Captain Kidner which I have mentioned gives abundant illustrations, and I feel that I must refer you to it instead of quoting from it as I hoped to do had time sufficed. And very likely my surgical colleague who follows me (here as he did at Orpington) may make reference to it. But the whole story reiterates and reinforces the dictum of Matthias Mayer, himself a veritable orthopædic surgeon, when he declared *"Simplex sigillum veri"* (as witness the peg leg and Thomas's splint). Simplicity is the seal of truth; duplicity and complexity are the seal of error. But not to exhaust your patience on half my theme, let me now take a hurried glance at the returned invalided soldier question, and it is my intention to view it from the critical, the unpopular and unfashionable viewpoint. In a speech by Mr. Elihu Root, at convocation (University of Toronto) the other day, I heard him reaffirm and assert the sovereignty of the individual as opposed to the State—the heresy and error of the radical political economists of England (mostly Scottish, as usual) of the eighteenth and nineteenth centuries. The returned

soldier, like Mr. Root, holds to the doctrine of the supremacy of individualism, which is worse than Bolshevikism. He thinks his obligation to the State is settled and ended, and that the State owes him everything, unmindful of the basic fact that the State does not, and never did, owe him anything except equality before the law, and equal rights with those similarly circumstanced with himself—an obligation which it still acknowledges and still discharges. The absolute liberty of the individual began to wane in the nomadic and patriarchal state of society and has been diminishing ever since to reach extinction when the commonwealth is at war and its existence jeopardised, at which time the considerations of the public weal overrides all others, and even the voice of the civil law is suppressed, and the din of arms (*silent enim leges inter arma*). Because this essentially sound doctrine has been pushed to an unjustifiable extremity in Germany is no reason why Bolshevikism and anarchy should be set up here. For all extremes and errors, the truth usually lies between, and Germany's present efficiency is the proof of which extremity is the lesser evil in a State, if we must tolerate "the falsehood of extremes."

Let us not mince matters, and let us look the situation squarely in the face; and, be it remembered, that, in the army medical service, we are dealing with the maimed and the enfeebled, the mutilated and the exhausted, the malingerer and the evader, and so may easily acquire an exaggerated notion of the shirking and the pusillanimity of some of our Canadian youth, so many of whose comrades have given proof of courage and endurance, of chivalry and devotion never exceeded in the annals of the race.

How many returned soldiers does one meet anxious to go back to the fighting line, to relieve or to reinforce the comrades they have left behind? How many does one see anxious to promote by every means their speediest recovery so as to be able at the earliest possible moment to join the army of industrious workers who provide the material sinews of the war; or even to do a day's work or earn an honest livelihood to render them independent of maintenance by the State? In your experience are they few or many?

If many, how shall we account for this decadence of manhood, this laxity of moral fibre, this vanishing virility?

I lay it to the charge of a sickly sentimentality. Self-commiseration is inherent in and natural to us all, and has no need of cultivation or reëducation; and she was a wise, if a Spartan, mother of heroes, who in the golden age of Greece could give her son departing to the wars a shield coupled with the injunction to bring it back victorious or come upon it; "ἢ τὰν ἢ ἐπὶ τάν," she said. A world of meaning

in those five words, and second only in their wealth and burden of pathos to those two uttered by the Greek father—you will find them in the Œdipus of Sophocles, but they are also written large in the family annals of to-day—when he found his son numbered with the slain: Ὦπαι! My son, my son!

Let us take another example of "the brave days of old" as Macaulay calls them, and summon back an instance of 458 B.C. to contrast with these degenerate days. The Roman army under Lucius Mincius is caught in a deep defile of Mount Algidas by an Æquian host, and its doom seems sealed. A meeting of the senate is hurriedly summoned and delegates despatched to Lucius Quinctius Cincinnatus, whom they find calmly digging in a field on the other side of the Tiber and tell him that the senate has named him dictator, and that he must proceed forthwith to succour the entrapped army. Without parley or ado he gathers his reinforcements and proceeds upon his mission. The Æquians are routed and the Roman army saved, and Cincinnatus returns to Rome and lays down the dictatorship and is back on the farm in sixteen days—

"From the field of food to the field of fight,
And back to the farm in a fortnight's flight."

This, indeed, is an incident to point a moral as well as adorn a tale. Are there any on our farms now anxious to take the field to relieve the war-worn heroes in the trenches? Five thousand agriculturists invade the senate house and blatantly demand an opportunity to answer "No"; and "Shout in Folly's horny tympanum such things as make the wise man dumb." How many who now "see Death entrenched preparing his assault" would gladly seek the furrow with the plough, but delay, when they do return, to fill the places which conscription has made vacant in the ranks of those who fought the enemy, no less, when they fed the allies with the forced labour of increased production?

Can you divine the cause? These heroes of ours went boldly forth to war, instinct with the spirit of freedom, each with Mr. Patrick Henry's sentiment in his mouth: Give me liberty, or give me death! They followed the apostolic injunction to the letter: they quitted themselves like men; they were strong to endure, many to die! For, as Dryden has told us:

"The love of liberty with life is given;
And life itself the inferior gift of Heaven."

The strain to which they were subjected, the descent into Hell, naturally tried to the uttermost the "distracted globes" in which reason

and self-control erstwhile had residence and made them supersensible to self-suggestion.

They return, many of them, wounded and broken men—but men. But men made supersensitive to suggestion of the false and suppression of the true, with morale depressed.

And how are they treated? Sensibly and rationally enough until they reach the base. And then, presto, change!

No sooner are they transferred from ambulance to bed than well-meaning, but too sympathetic padres and matrons, nursing sisters and V.A.D.'s surround them with cigarettes and matches (hairs of the dog which has already bitten them to distant, perhaps, but untimely death), and with creature comforts, sedulously and emulously endeavouring to anticipate every want, but never forgetting or omitting "the accursed weed." And, as if this were not enough to disturb the balance of a mere and common man, the next day and the following days, *ad infinitum,* so many ladies of high degree, of wealth and fashion, so many men of eminence and attainment in church and state, put themselves and their belongings, their houses, chattels, goods and gear at the service of these unfortunate men that they naturally and inevitably begin to think more highly of themselves then they ought to think for having done their duty, however nobly. And Plantus has said: *Is est honos homini pudico, meminisse officium suum.* "To a modest man, it is an honour sufficient to have remembered his duty." But it is nothing more. It were a disgrace to neglect it. And thou

> "Stern daughter of the voice of God,
> (O Duty, if that name thou love),
> Thou art a light to guide, a rod
> To check the erring and reprove!"
>
> "Yea, all things good await
> Him who cares not to be great,
> But as he saves or serves the State.
> Not once or twice in our rough island story,
> The path of Duty was the way to glory."

Thrice have I seen wounded men die with lighted cigarettes between their fingers, and these, of course, were none the worse; and three times have I known other three smoking surreptitiously at night, in bed, what Burton in his "Anatomy of Melancholy" has called "this damned, devilish, hellish" incense. Add then to this the ridiculous editorial laudation, and the effect of the absurd and extravagant speeches made on the floor of parliament, and the irrational and inordinate claims at times advanced by various organisations for patronising the returned soldier, and given a nervous system made oversusceptible to suggestion—hypnotised or mesmerised or Braidised or

what you will—and with its own inherent saving common sense starved by disuse and choked by eulogy, and what more logical "conclusion to the whole matter" can we expect than that which we find?

In the strong Saxon speech, then, of one of my colleagues, Highlander though he be, gifted with more common sense than most of us, "Cut it out"!

Cut out Venus and Bacchus (and in these days of prohibition let me substitute "Baccy" for Bacchus). Let their shrines be empty! (And here grant me the favour of one more digression suggested, nay compelled, by this chance reference to Venus and Bacchus, inseparable in my mind henceforth "while memory holds her seat in this distracted globe" from association with one of our best and brightest, "sanest and most obedient" to the highest laws of life, as wise as he was witty, as competent as clear-sighted, as devoted to duty as dearly beloved of gods and men, whose clarion call to those who "carry on" graces and sanctifies your programme's page to-day after that long roll of worthy names to which with averted heads and hands thrice filled with dust we answer, sorrowfully, yet proudly, "Dead on the Field of Honour!"

But to my story: The scene an ocean liner; the subject the Greek Anthology, picked up by one of us in Glasgow; Personæ: three friends, a clever classical lady from Kingston, Lieut.-Colonel John McCrae and the narrator. The object: Amusement. The Means: Translation of

—Rufinus's "Love and Wine."

Professor Mackail's translation (Professor of Poetry at Oxford) follows:—

Ὡχλισναι πρὸς Ἔρωτα περὶ στέρνοισι λογισμόν,
Οὐδέ με νικήσει, μουνος ἐὼν πρὸς ἕνα,
θανατὸς ὁ' ἀφανάτᾳ συστήσομαι· ἢν δὲ βοηφὸν
Βαχχον ἔχῃ, τί μόνος πρὸς δύ' ἐγὰ δύναμαι;

"I am armed against Love with a breastplate of Reason, neither shall he conquer me, one against one; yes, I, a mortal, will contend with him, the Immortal; but if he have Bacchus to second him, what can I do alone against the two?"

John McCrae's rendering, extempore and impromptu:—

"Me, a mortal, single-handed,
Love immortal can't subdue;
But the God with Bacchus banded,
Cuts my breastplate Reason through."

And now to conclude, at a long last, my word upon the returned soldier problem, is—

Cut out Venus and Bacchus. Cut out adulation and flattery; and

undue praise. Speak the words of truth and soberness. Take the advice of Homer, and cut out the sophistries and euphemisms in which "Follies are miscalled the crimes of fate." Combine work and play, pleasures and exercise. Lead thoughts along the lines of cheer and hopefulness and banish melancholy. Cut out indulgences, cultivate thrift, temperance in all things and sobriety in judgment. Cultivate "honour and clean mirth" amongst the men. Assist the returned men to develop their own self-respect, and spirit of independence and self-help; and eschew sentimental molly-coddling. Teach and help the men to investigate conditions and understand them before assuming that the authorities are in the wrong. Regard them as younger brothers and reprove them with sympathy and understanding accordingly. Encourage them to avoid and to despise, as unworthy of men, all trashy and salacious literature, and to read books which are at once useful and entertaining, through biographical association and illustration, such as Samuel Smiles' "Self Help," "Character," "Duty," "Thrift," and such like; books which they will finish with enjoyment, if they begin them and which John Murray publishes at a shilling apiece. Books which I have not found in any hospital library from ocean to ocean, nor on the bookshelves at Ottawa. Substitute for inane and silly moving pictures and trashy plays films of natural history and such like topics, and illustrative lectures which embody and improve the advice, "Go to the ant, thou sluggard, and learn wisdom; and to the bee and get understanding." Teach the men by counsel and example to prefer "the things which are more excellent." Likewise, and by the same means, inculcate the old stoic doctrine of the essential necessity of "self-reverence, self-knowledge, self-control," which three alone lead life to sovereign power. Yet not for power; power of herself would come uncalled for. But to live by law, acting the law we live by without fear, and, because right is right, to follow right were wisdom in the scorn of consequence." But if this ideal seems to them too high, then let them take Matthew Arnold's "Second Best" and make it their own, incorporate in their daily life:—

"Moderate tasks and moderate leisure,
Quiet living, strict kept measure,
Both in suffering and in pleasure—
'Tis for this thy nature yearns.

"But so many books thou readest,
But so many schemes thou breedest,
But so many wishes feedest,
That thy poor head almost turns.

"And (the world's so madly jangled,
Human things so fast entangled),
Nature's *wish* must now be strangled
For *that best* which she disarms.

"So it *must* be! Yet, while leading,
A strain'd life, while overfeeding,
Like the rest, his wit was reading,
No small profit that man earns.

"Who through all he meets can steer him,
Can reject what cannot clear him,
Cling to what can truly cheer him;
Who each day more surely learns.

"That an impulse from the *distance*
Of his deepest, best existence,
To the words, 'Hope, Light, Persistence,'
Strongly sets and truly burns."

FOOTNOTE.—Captain Kidner's name creates a prejudice in favour of his article because we know how full of energy and information his homonym is in the I. S. R. and therefore expect great things to be associated with it. Those of you who have not read the article will find it well worth perusing.

INDUSTRIAL REHABILITATION

H. E. T. Haultain, C.E.

Vice-President The Engineering Institute of Canada; Vice-President Canadian Mining Institute; Member of the Institution of Mining and Metallurgy, etc.; Professor of Mining Engineering, University of Toronto

From the Symposium on the "Problem of the Returned Soldier"

Professor Haultain was unable to wait for his turn to speak, but if the occassion had permitted, he would probably have spoken somewhat as follows:

Mr. Chairman, Ladies and Gentlemen,—The hour is late, and you have had a long and strenuous day. It would be entirely out of place, under these circumstances, to attempt to give you an adequate outline of the work of the vocational branch, but I cannot let this opportunity pass by without attempting something. I have been vocational officer for the Province of Ontario for about eight months, in charge of the work in Ontario of the vocational branch of the Invalided Soldiers' Commission of the Department of Soldiers Civil Reëstablishment of Ottawa. The head of this branch for the Dominion is Mr. W. E. Segsworth, director. This vocational branch is charged with the responsibilities in connection with all the special training given to the returned men with a view to aiding them to return to the industries. It is an industrial proposition rather than an educational one. It is not because I am a professor that I hold this position, but rather because for twenty years I was intimately connected with industries as a mining engineer before I became a professor. The work of this branch commences with the man at the earliest possible moment after his return to the hospitals in Canada and continues with him until months after he is placed in the industry. We begin our work at the bedside with what is known as "bedside or ward occupations," such as basket-making, sketching, needlework or other diversional occupations. We continue in the hospital in what, amongst other names, are called curative workshops. We continue after the discharge from hospital in a variety of ways, giving those men whose disabilities are such that they cannot return to their previous occupation, special training courses averaging about six months with pay and allowances. For these training courses we have enlisted many agencies—the technical schools, the universities, the industries themselves, and also not a few special classes of our own organisation. The problem is a large one. Being without precedent, we have to feel our way, which means making mistakes and profiting thereby, as well as

making direct progress. (As some illustration of the size of this work in Ontario alone, I may say that my head office in Toronto has a staff of over sixty-five engaged in studying and organising, and this staff is growing rapidly.)

If I can hold your attention any longer there is one idea that I would like to bring forward. You will note that the vocational branch provides, and maintains jurisdiction over, the personnel and the equipment for the ward occupations and curative workshops, that is, for the occupational therapy within the hospitals On the face of it, it seems without possibility of supporting argument, that non-medical men should attempt to play any such part within a hospital, and I am quite prepared to argue against it and if winning were to be by a show of hands, without doubt win practically unanimously in this assembly, but I would be arguing against my own convictions. After eight months of close intimacy with this branch I am convinced that this proposition of our maintaining this work in the hospitals is sane in theory and sound in practice. The time is not opportune for discussing this important phase of the subject, but the germ of the idea is something like this. You have just heard Colonel Russell draw a distinction between the malingerer and the psychopath. If you will allow me to mix your language with mine, let me suggest that all these returned men are industrial psychopaths. Even when made mentally and physically fit they are industrially unfit. These soldier patients in your hospitals need not only surgical and medical treatment but also some other treatment—perhaps Colonel Cameron with his happy command of the classics will be good enough to coin a word or phrase. Meanwhile the engineers, the professional men of the industries, are tackling their work under a variety of names. As far as it has gone, it has worked comfortably and we have received most gratifying support from the medical men. My attitude towards my staff in this work is something like this: "The work of the hospitals is curative; the doctor is absolutely dominant; you have no enforceable rights and no privileges other than that of being present. You are guests in another man's house. So long as you behave yourselves as becomes a guest you will receive all the gracious courtesies of a pleasant host. Your function is to coöperate so smoothly that it is a blending rather than a coöperation." And sir, that is the way it has worked out and is working out. My staff is made up largely of engineers—professional men. They are not all engineers, but nearly all the principal men are engineers or architects. They are the professional men of the industries, and as professional men they can coöperate with their brother professional men—the doctors—in service to the community.

PSYCHOGENETIC CONDITIONS IN SOLDIERS, THEIR AETIOLOGY, TREATMENT AND FINAL DISPOSAL

COLIN K. RUSSELL, M.D., LIEUT.-COLONEL C.A.M.C.

Opening communication of the Symposium on the "Problem of the Returned Soldier."

One of the very serious problems we in the medical profession of Canada have to deal with in the returned soldiers is met with in the treatment and final disposal of those suffering from what I have called psychogenetic conditions, from the Greek Ψυχη = the mind plus γενναω = I beget, that is, conditions which are born in the mind. This problem is by no means confined entirely to the medical profession, as I hope to show you, but it is for us first to have a very definite idea of the problem before us so that we may use our professional influence in the right direction.

It is not advisable to go into the details of numbers and percentages of returned casualties who come under this category. You will take my word for it that the problem is worthy of our serious consideration when I tell you that in the French army such cases have practically disappeared, save for the acute temporary conditions which are treated in the casualty clearing line close to the front.

Psychogenetic conditions may be divided into two groups: (*a*) malingerers, and (*b*) psychopaths. With regard to the first it is obvious that in one feigning disease or defect, his disability is begotten in his mind. He may feign paralysis or merely pain, or he may feign shell-shock and its varied subjective and objective disabilities, or anything else. For the moment I do not propose to go into any discussion of this condition, save merely to point out that it has always been considered the old soldier's privilege to put one over the medical officer by an exaggeration of his symptoms in order to escape duty. One would be entirely lacking in a sense of humour if one took serious objection to this attempt, if not carried to extremes. In war, however, it is our bounden duty to see that the humour of the situation remains on the side of the medical officer.

In turning to the second subdivision of this great psychogenetic group, one must first state that while theoretically there should be a definite dividing line between those two subdivisions, in practice this is often difficult, if not impossible to establish. Let us then consider the group of psychopaths, the real sufferers from a mental condition. These might be further subdivided into, first, those with a physical

disability, and secondly, those whose complaints are purely mental; though I must say I have been struck with the futility of refinements of classification.

With regard to the former, the disability complained of may vary from the complete paralysis of both legs to a mere limp in walking, from a general trembling or most exaggerated shaking of the limbs to definite and periodical convulsive seizures—from a complete blindness to a complete mutism—from a pain in the back to an inability to stand upright; and one has rather been struck by the fact that these types are apt to appear in epidemics. Early in the war the "trench back" was very common. I have not seen a case for eighteen months or more. The symptoms, then, may be protean. The only point in common in all these cases is that no physical lesion can be found to account for the symptoms complained of. In the case of complete paraplegia there are no pathological reflexes and no bladder disturbances. In the case of the limp, there is no sign of an injury sufficient to justify one in believeing it to be the sole cause of the limp; pain is complained of, but X-ray examination fails to reveal any bone lesion, and one cannot help having the feeling that if such severe pain as is complained of were really present for such a long time, something would be there to show for it. In the case of the general tremor, which is practically always volitional, there are no pathological reflexes and no suspicion of paralysis agitans, and it is not choreiform. In the convulsive seisures the movements are purposeful, thus distinguishing it from epilepsy; and while the face may become red it does not become cyanosed. The biting of the tongue and passing of urine might be simulated, but as a rule the tongue is not bitten severely enough to cause laceration. The same thing holds good in those cases of blindness or mutism, no evidence of optic atrophy or paralysis of the vocal cords can be found. In fact these cases are what we have been accustomed to call hysterical, but for which Babinski has introduced the term "pithiatism" from the Greek word $\pi\epsilon\iota\theta\omega$= I suggest, indicating that the incident of the peculiar physical symptoms are due to the influence of suggestion on the individual's mind. Other so-called stigmata of hysteria may be found to be present, the peculiar areas of anæthesia, and the contracted fields of vision, for instance; but particularly the increased suggestibility. In all genuine cases this latter symptom is always present and can usually be easily demonstrated and in fact these so-called stigmata are, as Babinski has shown, and my own experience confirms, merely evidences of it.

Of course, one must appreciate the fact that just as hysteria can simulate an organic paraplegia, it can also simulate any psychopathic disability.

The second subdivision—those suffering from purely mental symptoms—might be divided into psychasthenics and certain types of insanity.* These groups are, however, in my experience relatively unimportant, from a military point of view. Their numbers are relatively small, and I am of the opinion that the war has not been responsible for the initiation of the great majority of them. They are, as a rule (Farrar states in ninety per cent.) an aggravation of a preëxisting condition. It is the first two groups, and particularly the second, which have been greatly added to by the war, and which form our present problem; and I wish to repeat that these two groups merge the one into the other. Of course there are some—fortunately few—who are definitely malingering, and there are others who are definitely hysterical, where there is no room for doubt; but in which group could either of the following cases be put?

Private McK. was admitted complaining of blindness in both eyes, paralysis of the left arm, weakness of the left leg, all of which he stated he had had for six months, following being buried. His occupation in civil life has been as a medical student at Johns Hopkins Hospital, and he had been eighteen months at the front, he stated. My suspicion was aroused, after I had examined him and found no evidence of organic lesion, by the fact that he came to us from the National Hospital at Queen's Square, where I knew it was not the practice to send out such functional cases with their disabilities still present. I should have said he had a complete loss of sensibility to pin-prick over the left hand and arm up to the shoulder joint.

During my first talk to him in my examining room he suddenly uttered an exclamation and regained his sight and power in the left arm and leg, and I sent him to duty around the hospital. A week or ten days later, however, after his affectionate advances had been rather violently spurned by a Ramsgate lady, he came to the examining room apparently quite blind again. I was not altogether surprised, as the young lady's mother had previously consulted me in the matter. As a matter of fact, when he was warned of the danger of the game he was playing, it did not take him many minutes to regain all his faculties, and he was sent to duty in France. His whole story was a tissue of lies. He was not a medical student and I afterwards learned that when he left Queen's Square, he had no disability at all; he must have developed it on his journey from London to Ramsgate.

* Neurasthenia should not be considered as a psychogenetic condition. I would consider it rather an organic nervous exhaustion, either as part of a complete exhaustion due to prolonged strain, or the nervous exhaustion due to the reflex irritation of the nervous system caused by organic disease.

Another case of Private R., who was admitted with his right leg completely paralysed and the left partially so, he had been using crutches for six months and had developed a wrist-drop of his right arm which he thought was due to the crutches. Examination showed the leg swollen and cyanosed, and with complete loss of sensibility to pin-prick extending up to the hip joint. There was loss of sensibility also in the right arm to the elbow joint. No evidence of any organic lesion could be found. After being told that his disability was purely mental, he confessed that it had commenced with a pain in his knee; that he had not used his legs as much as he might have. He stated that he had not done this on his own account but on account of his mother who, sometime after he enlisted, had been left alone and unprotected by the enlistment of his two brothers. He had wanted to get back to her. He stated that shortly after he found that he was unable to move his leg, that his left leg began to become affected, and he had to take to crutches. These very soon caused a crutch-paralysis to develop. Just that morning he stated he had tried to use his limbs and had been unable to do so. He walked out of the examining room perfectly well, and has remained well ever since. In fact, I recently saw that he had obtained a commission.

Evidently in the first case, we have a condition of malingering on a basis of hysteria, and in the second case we have hysteria on a basis of malingering.

I wish to record here some ideas on the differentiation between psychogenetic conditions of the malingering type and those of a more genuine and sincere type which evolved during my period of duty as neurologist in charge of the Granville Canadian Special Hospital, and it may be interesting to follow the way in which they evolved.

Certain of these psychogenetic cases I just naturally treated with military sterness, and without much apparent sympathy, simply making them do what they said they could not do, but for which of course I knew there was no organic cause to prevent them. Others I took sympathetically and led them along with reason, persuasion, and encouragement. When asked why I made the distinction I could only answer at that time that my experience had taught me which was the way to take them. As a rule, whichever method I used, worked well. Realising there must be some underlying reason for the difference in methods, I was led to the following, after reading William McDougall's "Social Psychology."

We have noticed in all these genuine psychogenetic hysteric or pithiatic conditions there is a greatly increased suggestibility which has been produced as a result of the terror under which they have

laboured. McDougall, in discussing the emotions of admiration and awe, shows that under the influence of either there is an increased suggestibility. In analysing these emotions he shows that admiration is made up of wonder plus what he terms a negative self-feeling—a feeling that we are in the presence of a superior power, something greater than ourselves. Certainly we are all in a more suggestible state of mind towards one whom we admire than towards one whom we do not, we are more likely to be influenced by his words or actions.

In the same way in his analysis of the emotion "awe" he shows it to be made up of a negative self-feeling plus wonder plus a suspicion of fear. Under the influence of "awe" we are more suggestible.

Terror, on analysis, is made up of fear with a much exaggerated negative self-feeling element, and here too we have found the increased suggestibility.

In all three emotions we have found the resultant increased suggestibility and the only common factor on the other side of the equations is the negative self-feeling. Therefore the negative self-feeling must be the cause of the increased suggestibility. When, therefore, I see a man with a psychogenetic disability who is unreasonably antagonistic, self-assertive and inclined to be impudent, I realise that that man has not the negative self-feeling one expects to find in a genuine case, and I feel he is more of the malingering type and trying to deceive me which one naturally does not knowingly permit. Not only that, but to treat these cases efficiently, it is necessary to inspire that necessary negative self-feeling and the consequent increased suggestibility, one can reason out the effect of unrestrained emotional sympathy.

It is unnecessary to quote cases of uncomplicated hysteria, such as a man who was admitted with a complete paralysis of both legs which he had had for sixteen months and which had necessitated his being carried around on a stretcher for that period, who nevertheless was made to walk perfectly inside of an hour. Such cases were not at all rare. It is interesting, however, to try and work out the reason for the development of such conditions. To do so we must go back to the primitive beginnings and consider the primitive instincts. We must first appreciate the fact that an instinct is a primitive innate tendency. There are two essentially primitive instincts: the instinct of self-preservation, and the instinct of procreation. These are primitive: they must have been present in the early beginnings of animal life. Their absence in an individual would certainly have assured his not being represented in the present generation. These instincts are born in us. They are tendencies, that is,

a constant leaning or urging in a certain direction; and it is only relatively late in the development of man that he has, with the development of his larger brain, learned to control the urging of these instincts. Their urging is, nevertheless, constantly present, and at times, it becomes insistent.

If in an individual there has been a lack of development of the higher centres producing a condition of mental deficiency or feeble-mindedness, it will be readily seen that there will probably be less control of these instincts and their peculiar emotions, and in fact it has been found that it is a bad economic proposition to spend time and money in endeavouring to make soldiers of this class of individual. A certain number of these individuals were enlisted during the voluntary enlistment period owing to the enthusiasm to fill up the ranks of a battalion, and many of them have come back diagnosed as "shell-shock." We must also recognise the fact that as the necessary mental control involves effort which might be compared to a physical effort, in that it produces physical fatigue, and as we all have our individual physical limitations, there comes a time when this effort becomes well nigh if not completely impossible. For example if a man has stood the strain for six to eighteen months in the line, I personally do not feel like criticising him for losing his control under exceptional conditions.

When a soldier is first introduced to the fighting line, or even under the apprehension of that danger, his instinct of self-preservation will be strongly stimulated, and he will suffer from the emotion peculiar to that instinct, namely, fear. That is natural. Ordinarily the discipline he has learned and his own self-respect are sufficient inducements for him to exert his intellectual power in controlling the impulses set up by his emotions. This intellectual power is, as I have said, a more lately acquired faculty and is more subject to local influences. Lack of sleep or food, or the general malaise associated with a fever, or anything else that interferes with his feeling of well-being, will lessen his intellectual control. Under such circumstances, the sudden onset of some great danger or horrible experience will stimulate his primitive instinct of self-preservation, whose centre is probably in the basal ganglia. The radiations or impulses set up by the stimulation of that centre, like the radiations from a powerful wireless station, jamb the radiations which are set up in the relatively weakened cerebral centres, so as that their message can no longer be read. When one sees a man pulling his rubber sheet over him to hide himself from the shells, one realises that here is a vivid example of the old instinct of flight and concealment, and that such an individual's higher centres

are not acting as they should. Under such circumstances, in the absence of the censor as it were, that individual becomes very suggestible. He is in a mental condition ready to believe anything, especially anything that will relieve him of his fear and relieve the anxiety of his guardian instinct of self-preservation.

In studying cases of mutism, for example, one is led to the following interpretation; one realises that there is a very close association tract between the emotion fear and the voice centres. If a child is frightened, it cries. The warning cry of animals is the cry of fear. Under intense fear the natural reaction is to cry out. Fear is often so intense that the individual cannot cry, his throat muscles having gone into spasm owing to the strength of the stimulus. When, however, that fear is passed, on the individual attempting to use his voice, owing to the close association tract already mentioned between the voice centre and the centre of fear, there is immediately called up in his mind the picture of the extreme terror he was under. The mind has a natural protective method of suppressing anything that is unpleasant. If one has a recurring unpleasant thought, he will immediately think of something else. He will shove it down out of consciousness. So in this case the thought of the terror being decidedly unpleasant, the mind suppresses it, and with it the voice—so that it will not be recalled.

In the same way the functional paralysis of the arm may result from an injury received when the individual is suffering from great emotional strain. The natural reaction to fear, the quickening of the heart, the shaking of the knees, the profuse perspiration, the involuntary micturition, strange and unaccustomed symptoms to the ordinary individual, become very potent suggestions of organic disease.

Take, for example, the man who after a week with his battery was returned to the special shell-shock hospital suffering from general tremour. When asked what he complained of, he stated that his "nerves were broken," that he was not strong enough to stand the life. When asked if he had been afraid, he asserted rather violently he had not—he had never been afraid of any man. When it is explained to him that his nerves could not be broken, that he really meant that he had lost control of himself, he asserted that he was not strong enough to stand the life owing to the fact that he had heart disease, and that if he had been examined by the medical officer he would not have been sent to the front on that account. Examination of the heart showed it perfectly normal and on being assured of this, he stated that in any case he had done "his bit," and he should not have to go back to the front. He had done fourteen months' duty on the

coast defence in England, and he had taken on this position in the early days when there was little or no protection and he had been exposed to all sorts of weather and hardships. When he received the assurance that we did not criticise anybody for being afraid, that it was a very natural phenomenon, he then admitted that he did have his wind up, and in fact he had been very much afraid.

If one analyses this case one sees the natural reaction of the mind in suppressing the unpleasant truth that he was afraid. He violently asserted that he was not afraid of any man. One sees also another natural reaction on the mind in defending the individual to himself. His first defence was that owing to heart disease he was not physically strong enough and when that was put out of court, his second defence that he had already done "his bit," and that he should not be called upon to go to the front. When it was pointed out that it was hardly just to compare fourteen months on the coast defence in England with fourteen months in the front line, as many of his fellows in the battery have done, he rationalised his whole condition and was in a position to appreciate the injustice of leaving other men to do his share who, though just as much afraid as he was, were controlling their emotions effectively.

One will appreciate that in order to make an individual thus rationalise his ideas and then appeal to his higher control, one takes for granted that he is a man of average amount of intelligence. In the case of the feeble-minded, such a method is hopeless.

It is not necessary to go into all the symptoms which one may meet in these conditions. When one realises the numberless sources of suggestion, one can appreciate their protean character. In the treatment of these cases a thorough knowledge and examination of the nervous system is necessary to exclude any organic disease. With the assurance that there is no organic disease present, a broad human charity and a personal interest in the explanation of the individual symptoms are essential. The patient must be made to understand the causative factor played by the primitive emotions, and he must be made to rationalise the ideas which have been set up. In this way his discipline, his self-respect, his higher control can be called upon to take command again.

In this way only can such patients be cured. Any methods of suggestion are insufficient, simply diverting as they do the patient's ideas. Hypnotism which is merely induced hysteria, cannot reasonably be expected to cure; it is granted that by this means the symptoms can often be relieved, it is, however, by super-inducing a further condition of hysteria, and the probability is relapse on the first moment

of strain and emotion. His condition and disability depending entirely upon ideas, cannot be influenced except superficially by drugs or mechanical treatment. Reason is the only thing that will appeal to or change ideas.

If functional paralysis of a limb be present, it is a simple thing to show him by means of a strong electric current suddenly applied that he has got voluntary power in the limb—once having seen this he will call on it. In the same way the voice can be shown to be unaltered. In cases of tremour, once the real origin of the trouble is accepted by him, if the patient is persuaded to relax the muscles, the tremour ceases. One always notices that these patients when endeavouring to control the tremour put all their muscles tense, which simply serves to increase it.

When a patient is diagnosed as psychogenetic, one should use equally scientific rational methods with him as one would in the case of any bacterial infection. If the patient comes complaining of loss of appetite and on examination one finds he has typhoid fever, one does not treat the loss of appetite. One tells him frankly he has typhoid fever and gives him treatment which has been recognised as reasonable and proper from a knowledge of the pathology of the disease.

If a man complains of a pain in his back and after the most thorough examination we can find no organic disease, we decide it is a neurosis, *i.e.* it is mental in origin. Surely it is not the part of science to give him a plaster jacket. Such action will simply impress on the patient still more deeply the idea that he has an organic lesion, and make it more difficult to eradicate.

It is evident that the final disposal of the man and his expectation as to pension will have a decided influence on his condition. If by his disability he is going to escape future danger and is going to receive a more or less satisfying pension and his future is going to be cared for without any work on his part, he has small inducement offered to him to make the effort to use his higher control. In the French army this has been recognised and their ruling now is that hysterical disabilities will warrant no pension, no gratuity, and no discharge from the army, that where a definite wound is associated with hysterical disability the latter must not be considered in estimating his pensionable disability, and in no case does such functional disability warrant discharge from the army. The result of putting into practice of this legislation is that it is not worth while to develop shell-shock in the French army.

It is worthy of notice that so-called shell-shock is not observed

among our German prisoners. These men have been under the same strain and exposure that our men have been subjected to. The only difference is that, they, being prisoners, know that they will not be again called upon to enter the firing line and they are no longer under any apprehension of danger. Their instinct of self-preservation, in other words, is at rest, and there is no question of pension to have its influence.

In England, on the other hand, a very different state of affairs exists, and it is only recently that efficient methods have been adopted to treat these cases in special hospitals. Previous to that many were discharged to civic life with a fairly big pension. It was a common experience that even in civic life many of these were inefficient.

Sitting on the special medical board which dealt with these cases one would see men who had been discharged some months to their own control, who had again become total disabilities. Let me quote two typical cases: One had been discharged from the hospital to return to his command depot. On the train while leaning out of the window an engine in the neighbourhood whistled. He immediately fell back in the compartment, shaking all over, and was returned to the hospital a complete disability.

Another who had been discharged to civic life and had been carrying on for some months, while in Paddington Station one day there was an air raid warning. Everybody moved towards the underground, this man with the others. An engine in the station whistled: in his own words, he fell down in a severe hysterical convulsion. Somebody threw him into a baggage car, and the train ran out of the station. Its first stop was at Taplow, and he was taken off and sent to the hospital there. When seen, he was walking with crutches, dragging his legs behind him.

In neither of these cases was there any sign of organic disease found. They had been startled by an idea and had lost control of themselves. Being a pensioner, this later patient would be advised to go to the first home of recovery, a fine old house in beautiful grounds with a fine billiard table and interesting occupations found for the patients. While there he would be receiving 27*s*. 6*d*. a week, with 13*s*. for his wife, and so much for each of his children. He would live there for six weeks or two months like a gentleman of means, well cared for and well fed, and with an interesting occupation. At the end of that time if sufficiently recovered he would come to the special medical board and might well receive an increase to his pension on account of his nervous instability. Now, we saw in the first place that his condition was due to an idea, and we must realise that only reason

will appeal to an idea. If all the reasons that are being given a man are such as to encourage him in his condition, it is hopeless to expect that his ideas will be influenced beneficially.

It therefore seems to me essential that in dealing with this type of case in Canada we must first of all follow the plans which have been adopted in the French army, and in the British army in France. We must have special hospitals where these patients will be segregated immediately on their arrival in Canada. These centres will be under the supervision of specially trained men; secondly, that no patient showing gross objective functional disturbance shall in future be discharged from the army; thirdly, that such psychogenetic conditions shall not warrant any pension or gratuity; fourthly, in the event of such patients relapsing in their condition after their discharge from the army, they shall be returned to the special neurological centre from which they were discharged.

In psychasthenics, where pre-war disability can be demonstrated—and Captain Farrar states it can be so in ninety per cent. of the cases—it should, by appropriate treatment, be reduced to as near the pre-war disability as possible, and they should be discharged without pension or with pension covering the estimated amount of the aggravation.

With the carrying out of these recommendations one could justifiably hope for; first, the return of a greater number to military duty; secondly, a greater efficiency in civilian occupation in those discharged to their own control; third, a very decided diminution in the amount of pensions.

With regard to the feeble-minded to whom we have made reference. One recognises that this condition of mental deficiency was not induced nor aggravated by military service in the great majority of cases. In what way should they be disposed of? When discharged, many of this type drift back to the hospital for a while at least, usually on insufficient medical grounds. While we recognise that this disability does not warrant a pension, it is my opinion that from a national economic point of view, the State should become the guardians of such individuals. They should be collected into colonies where they might be made partially self-supporting at least, under supervision, otherwise they will become the tramps, ne'er-do-wells and criminal class always so greatly augmented in the train of war.

THE SURGERY OF NERVE INJURY

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From the Symposium of the "Problem of the Returned Soldier."

A perfect nerve supply is so important to the individual that when a large mixed nerve of the arm or leg is badly injured (such as the sciatic or musculo-spiral) the disability is at once severe, and, until rectified, the limb practically becomes useless. Realising that there are many types of injuries, from simple bruising, to complete division, as well as involvement in scar tissue, callus and the like, this paper deals only with the direct surgical treatment of a divided nerve, and the best procedure to give the quickest and surest result. Since the first case operated nearly seventeen years ago, the largest number, of course, have been met with during the war, and comprise those overseas and on service in Canada. It is for this reason that one can only speak of actual results in a few of the earlier cases, since those of a later date will only be properly placed at some future time. Opportunities for study at the present, on account of the war, are greater than ever before, a very large number being now available. After the all-important necessity for relaxation of muscles; attending to movements and massage of joints; the use of splints and electricity, so that when the nerve is restored it will be in the best receptive condition for the return to normal function—questions arise that are many and important.

Did the injury cause immediate paralysis partial or complete, and, if not, how long after? Was it noticed only after the splint was removed or callus had formed? Was the wound septic and so on? The most complete history therefore is essential in arriving at a diagnosis of the condition of the nerve If the paralysis is immediate and complete, the nerve is more often completely divided (though not by any means invariably so). If the latter, the chances are in favour of involvement in scar tissue, or callus, or resulting from sepsis. One is impressed with the fact that nearly all of these wounds reaching a base hospital are septic, arriving as they do some days after injury at the firing line. A clean wound is indeed a great rarity. Since nerve sutures in bullet wounds, at least, are necessarily nearly always secondary, sepsis plays a most malignant rôle. From choice, one would not think of cutting down in this condition but would rather wait some months after the wound had completely healed. There is

no arbitrary rule on this point and must be left to the judgment of the surgeon, still four months for ordinary infection and six or more for the gas baccillus seems to be fairly general.

The treatment adopted by the staff of the Ontario Military Hospital during my service there was to leave these cases alone, to make no dissections or attempts to find the nerve, but to treat the septic condition under general surgical principles. For instance, there was a ward completely taken up by Carrel Dakins' method of treatment for all kinds of wounds, but at the same time other solutions as boric acid, plain boiled water, iodine solution and the like were tried in order to arrive at some comparative value of these various preparations. If complicated by paralysis, it was only after the wound had completely healed for some time that we dared an investigation. There were median and ulnar nerves bound down in scar tissue, likewise the cords of brachial plexus in two cases from shrapnel bullets; some sciaties and an anterior crural, a few in callus and the like, and occasionally a nerve without any apparent injury whatever.

In uniting a musculo-spiral this spring, involved in callus from severe gunshot wound, of the right arm, a reinfection took place after the wound had been completely closed for ten months, so one never really knows when this condition will occur, and yet my first case was undertaken seventeen years ago under similar conditions but with excellent results, as will be shown in a few moments. Although the wound should be healed first and repair made afterward, yet, if one can see the ends of a large nerve in a septic wound, the proper course to adopt would be to unite them at the time if the process does not involve actual dissection. The nerve will be improved by being brought in continuity, with a minimum amount of scar tissue between the ends, and will be easy to find later if necessary, and not be so widely separated and blocked by scar tissue. On this point one sees an exception to the general rule. When a case presents itself to the surgeon he must ask the question: "Is the nerve divided or bruised." since in so many cases injured nerves give the same symptoms as one completely divided. Can anyone distinguish between them? The general opinion is in the negative. Neurologists give differences in sensory, motor and electrical signs, but no one is absolutely certain. Some of my cases which were later found by operation to be bruised but not divided, gave the one almost constant symptom of pain and in some this was excruciating. A man was struck on the ulnar nerve at the elbow by the corner of a falling door causing complete paralysis, followed by severe pain which lasted three weeks and necessitated the use of morphine. The course suggested was incision into the

sheath for relief of tension, but this was not done. The paralysis lasted six months and two weeks, and took apparently the regular course of a divided nerve. One author says "diagnosis can only be made when the nerve ends are actually seen." This being the case, what is the proper procedure? If you operate, the nerve may be intact, therefore nothing to be done. If, on the other hand, you wait the regulation eight to twelve months, you lose a valuable amount of time, and after suture another year or more for success, during which period the muscles and joints are without their trophic stimuli and must be kept constantly in condition for the moment when the nerve is restored. It is advisable not to wait, but, if other conditions are favourable, discover the exact condition by operation and not waste time.

Operation in some of these cases found the nerve slightly irregular and apparently thicker in places, but undivided. A discussion of this type is beyond the scope of this paper. Suppose the condition being favourable, the operation is performed and the nerve found to be divided, you all know the condition met with. The ends are more or less widely separated, buried in scar tissue, frayed out or bulbous. Larger on the proximal and smaller on the distal end. But this latter does not always occur. In a sciatic suture (early part of March—McC.) the distal end was distinctly larger than the proximal (a very rare condition), the only case that has come under my observation.

What is the procedure? The answer is quite easy if one can approximate the ends without tension. But suppose you are met with the problem of five or six cm. shortening and the nerve cannot possibly be brought together. That is a different story. One of these cases was the ulnar nerve in the forearm with a loss of five cm., and the ends were united with strands of catgut and surrounded by a complete sheath of fascia. One year after there was some slight improvement (Scott, March 7th, 1912) but never a satisfactory recovery, in fact, practically a failure. Another involved the median and ulnar, where the latter was destroyed for over six cm. by the teeth of a binder. The upper and lower ends were buried in the sheath of the median nerve (lateral anastomosis—early November, 1906). This case was much more successful than the last, but not by any means complete, though some considerable function was restored. So that from all one gathers from cases both actual and experimental, the various methods in use at the present time in bridging a wide space are far from encouraging, as compared with the direct end to end anastomosis. Indeed one explores the literature to find a few successful cases.

When the latter cannot be accomplished, a piece of the same nerve split and turned down to fill the gap is far preferable to any foreign substance, even a piece of nerve taken from other part of the body, but with this the results are far from satisfactory.

Although in end to end anastomosis, the restoration of the nerve's continuity is no guarantee of its ultimate recovery, this, after all is undoubtedly by far the most rational and successful method. This being the case, how much greater must be the difficulties of recovery when substitution has to be made by bridging with various foreign substances. Time does not permit any discussion of these methods, so well known by every surgeon present, except perhaps mention may be made of a piece of artery or vein filled with agar-agar or some other medium through which the axis cylinder may grow. But any tube which collapses and allows scar tissue to come between the ends will likely be doomed to failure, because it seems almost certain that blocking of the path by non-penetrable scar tissue is the greatest cause of failure after suturing divided nerve ends. By far the best method then, the surest and safest, is to bring the ends together accurately, stripped of all scar tissue and bulbous overgrowth, until the nerve-bundles are easily seen and the ends bleeding slightly, with a suture directly through the nerve one cm. back, accurate coaptation, and held in that position. Muscle was used in some of these cases but a pad of fat or fascia equally insulate the suture line. It is not remarkable that in division of the fifth nerve every scheme a surgeon can think of is tried to prevent union and yet, in ten or twelve months, the neuralgia returns as formidable as before, yet, in the nerves under discussion, a return of function is one of the most difficult problems in surgery!

Now, after a consideration of all these different methods and passing judgment on the results, what can be done where a large nerve such as a musculo-spiral is entirely destroyed for six cm. or more and cannot possibly be brought together. The answer to that is the removal of a part of the bone to obtain the desired effect. Join the nerve in the most approved manner, plate the bone, place fat, muscle or fascia to prevent involvement in callus, put the arm up in the most relaxed position for all affected muscles (taking care to attend to all details on tendons and joints), and rest with the almost sure conviction that, in a reasonable time, sensation will return and the arm again be a useful member. It seems foolish to fiddle and experiment in such a crisis, since we know that direct suturing offers practically the only chance for success; when the patient's future usefulness is at stake (especially if the right arm be involved) and if he

is compelled as the majority of us are, to earn his living by the sweat of his brow. In order to illustrate this in a practical way, this man consented to come here to-day for your inspection.

In the winter of 1901 (some seventeen years ago) this patient received a wound in his arm from a No. 12 shotgun while on a shooting expedition in the woods of Pennsylvania. The bone was fractured and the musculo-spiral completely paralysed. Fifteen months later he came under my care. The sinus was still discharging pus, and paralysis was complete. The patient requested amputation. Being a young labouring man in the early twenties, with a long life ahead of him, this suggestion was ignored and operation attempted to suture the nerve. March 22nd, 1902, I dissected out the musculo-spiral nerve below and above. The ends were brought in opposition after six centimetres of bone had been removed. Fascia was placed between the nerve and the bone to prevent callus involvement and a drain was inserted on account of a septic sinus being present. The nerve was cut back with a sharp knife until the bundles were distinctly seen and blood oozed from the ends. These two factors undoubtedly form the ideal conditions for successful union. Silk sutures were used in this case. For four weeks discharge of pus kept up but greatly lessened. Eight weeks later there was no union of the bone and it was decided to use a plate.

July 30th, 1902, a silver plate was made by a local jeweller and with four screws was placed in position and the arm and shoulder encased in plaster of paris.

September 10th, 1902, the plaster was removed and firm union found to be established.

December 12th, 1902, an operation was then performed to remove the plate, the patient having fallen from his bicycle a month before, and three screws having worked out of the wound. Sensation returned in six weeks and motion on September 16th, six months and two days. This was first noticed by extension of fingers, then the wrist, and the movements of the thumb last.

October 1st, all movements were complete.

It is asserted that "After secondary suture epicritic sensation never returns." It is present in this case.

If you will allow me to say so, it seems that this was one of the first if not the first plate used in this country for uniting bone (now seventeen years ago) and the only case, as far as can be found by me in the literature where bone has been deliberately sacrificed to unite a large nerve.

THE PLACE OF PHYSIOTHERAPY IN THE TREATMENT OF THE WOUNDED AND DISABLED SOLDIER

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The time at my disposal is short, so if my remarks appear terse and somewhat dogmatic, I pray you to put it down to lack of time rather than lack of desire to speak on so engrossing a subject as that of the treatment of the wounded and disabled soldier.

By wounded, we include not only those grosser anatomical injuries caused by material substances such as shells, bullets or bayonets, liquid fire, or poison gas, but also those finer anatomical lesions of more highly organised tissues caused by intense fatigue, prolonged nervous tension associated with want of sleep, or undue exposure to inclement conditions, associated with one or the other or both of the previous conditions. Sometimes it happens that both the gross and finer anatomical lesions coëxist, although, as Colonel Russell has pointed out, there is not the same incentive for the latter lesions, in the case of the brain, to persist in these latter cases.

The study of the best means to overcome the conditions produced by these wounds has occupied the best minds in orthopædy and physiotherapy in England, France and Belgium; it is now occupying the minds of the best men in the United States, and to those of us in Canada who have had some experience on the other side, it is not without its tragic interest here.

The impelling causes for this search for some standard general rule of treatment may be briefly put down to four causes:—

(*i.*) The impelling desire of those possessing some skill and knowledge of the subject to use it for the betterment of their fellow-men.

(*ii.*) The insistent need of repairing the wastage of men caused by battles, and, in view of the shortage of man power by the allies, the imperative need of returning as many as possible to the firing line (*a*) by returning the actual man, (*b*) by rendering him so far fit as to be able to replace a fighting man at the base and release him for the front line;

(*iii.*) The desire to fit those for civil occupations who are no longer fit for the arduous work of fighting;

(*iv.*) The desire to lessen the liability of the State by pensions, by lessening the disability and increasing the number of those in Class *iii.*

Various means have been adopted, first in France; secondly, by the Canadians in England; thirdly, by the English, and, lastly, by the Canadians in Canada. What those means are too many of us are only too well aware: surgical interference, either of bone, nerve or tedon, with subsequent baths of various kinds; massage; passive, active and resisted movements; electricity in its various forms, heat radiant or due to electric currents; training of finer muscle coördination (such as you saw in the demonstration room by a group of three of our muscle function trainers from the Military College, Hart House); grosser coördination or gymnasium work; joint and muscle function training in games; and workshops for occupational therapy; and, finally, a modified physical drill.

The plans laid down for this work in Canada are ambitious in their scope; the problem is to make it simple in its application. Obviously coördination and organisation are the key-words. Hence the establishment of a military school of orthopædic surgery and physiotherapy, training not only personnel to carry out treatments in our various hospital centres on a well-defined plan, but to train medical officers to carry out this plan efficiently.

The apparatus exhibited is only one of the problems we are endeavouring to solve, the evolution of a standard set for truer coördination.

SECTION VII

SURGERY

RADICAL OPERATION FOR CANCER OF THE BREAST

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The history of the development of the radical operation for the breast cancer is of interest. We owe our modern ideas of cancer of the breast, its modes of metastasis, and its surgical attack, to the early works of von Volkmann (1), Kuester (2), Gerster (3), Heidenhain (4), Willy Meyer (5), and Halsted (6), which have as underlying principles the wide removal of the breast with the pectoral muscles, and a thorough dissection of the axillary space. In recent years many operations have been devised by and named after different men, which can lay no claim to originality other than a new method of skin incision. Nothing new, except the removal of the fascia of the recti muscles, as advocated by Handley (7), in 1906, has been added to our knowledge of breast cancer and its control since 1894, when Willy Meyer and Halsted described, almost simultaneously, their operations.

Cancer of the breast was known by the early surgeons to involve the axilla. In 1875 von Volkmann, as a result of microscopical study, found the mammary lymphatics communicating with those of the pectoral fascia, and advised the removal of the breast, the pectoral fascia, and dissection of the axillary space. Kuester, in 1883, urged that the axilla be cleaned out in all cases of breast cancer. A. G. Gerster, in 1885, advocated axillary dissection before removal of the breast. He believed that the handling of the tumor during the operation increased the risk of forcing cancer cells into the lymphatics. The great work of Heidenhain, in 1889, is well known. He made a careful microscopical study of eighteen specimens, and showed that, in a number of cases, the pectoralis major muscle had become involved with cancer

cells. He advised complete removal of the pectoral muscle if the tumor was in any way attached to it.

Willy Meyer in a recent paper says, "Following the work of Heidenhain, it became customary for surgeons to remove the breast with the pectoral fascia, clean out the axilla, and then to extirpate the muscle, as a second part of the operation." In 1894, the great works of Willy Meyer (5) and Halsted (6) were published almost simultaneously, each advocating the wide removal of the breast, including both the pectoral muscles, and a thorough anatomical dissection of the axilla. These two operations differ in point of attack. Meyer explores the axilla first, and ligates the vessels at their point of origin. Halsted removes the breast first, and cleans out the axilla last.

Many different incisions have been planned since the papers of Meyer and Halsted—notably by Warren, Rodman, Jackson, Elsberg and Stewart; but the underlying principles of the operation have been the same as suggested by Meyer and Halsted, with one notable addition, that of the removal of the fascia of the recti muscles to prevent fascial plane metastasis, suggested by Handley in 1906. This principle is sound, and has been adopted by most surgeons doing the radical breast operation.

The operation suggested by Meyer, and popularized by Rodman, I described, in 1914, under the name of the Rodman operation. In this paper I quoted Rodman, who said, "Willy Meyer first suggested and employed the method of primary axillary attack," and I emphasized the points of advantage I thought this method had over the one of primary breast attack. In the first place, it gives the opportunity of inspecting the condition of the axilla before deciding whether it is justifiable to remove the breast. Occasionally, the axilla will be found to be so extensively involved by cancer that operation for the removal of the breast is contra-indicated; whereas if the breast is attacked first, and the condition of the axilla be discovered later, a needless operation may have to be completed. (This was taught by S. W. Gross in the early 80's.) In attacking the axilla first, the dissection is carried from a clean to an infected area. The tumor in the breast is handled less, and the danger of expressing cancer cells into the lymphatic circulation is greatly reduced. By ligating the axillary vessels at their points of origin, the amount of blood lost is greatly reduced, and the operation made much less difficult. More blood is lost in any type of operation which attacks the breast first, instead of the axilla, because the same vessels are cut across several times in working toward their points of origin.

Rodman thought the function of the arm was better if the clavic-

ular portion of the muscle was not removed, but excised the entire muscle if the growth was in the upper outer quadrant of the breast. Meyer, fearing muscle metastasis, removes the entire muscle. Since reading Meyer's latest paper, published in 1917, we have been removing the muscle entirely, and have noticed no difference in the functional use of the arm. Rodman planned to keep his incision away from the arm, in order to give a better functional result and lessen the danger of post operative edema of the arm. A brief description of Meyer's operation, as modified and popularized by Rodman is as follows:

A primary straight incision is made, beginning one inch below the clavicle, two fingers' breadth from and parallel to the sulcus between the deltoid and pectoralis major muscle. It extends well below the free edges of the pectoralis major muscle, and is usually five or six inches in length. The axilla is exposed by severing the tendons of the pectoralis major and minor muscles at their insertions. The acromiothoracic and the long thoracic arteries run parallel (above and below, respectively) to the tendon of the pectoralis minor muscle, and should not be injured during this step of the operation. By cutting the costocoracoid membrane, the space of Morenheim is well exposed.

The dissection of the axilla begins at the apex, and extends from above downward and from within outward. As the sheath and fat are removed from the axillary vessels, the acromial, long and alar thoracic, and the subscapularis branches of the axillary artery are encountered in the order named. These, with their accompanying veins, are cut and the proximal ends ligated. No attempt should be made to remove individual enlarged glands. The contents of the axilla should be removed *en masse,* as a gland-bearing fascia. When this dissection has been completed, nothing is left on the inner aspect of the axilla but the posterior thoracic, or nerve of Bell, and, posteriorly, the subscapular nerve.

The breast is removed by an incision beginning at the middle of the primary incision, encircling the breast, and extending downward to a point midway between the ensiform and umbilicus. The oval should be five or six inches or more at its greatest breadth, and its margins should not come within two and one-half or three inches of the growth. The subcutaneous tissues are cut on a slant, so that the skin is everywhere undermined for a distance of several inches from the edges of the wound. Rodman and Judd practice free dissection of the superficial and deep fascia, as first advocated by Mr. Handley, who believes that the peritoneal cavity has been invaded by the permeation of cancer-cells along fascial planes, the rectus particularly.

While a large amount of skin, equidistant in all directions, must

be removed, it is rarely that skin-grafting ever becomes necessary to close the wound. Judd showed that recurrences in the skin occur more frequently in cases in which a large amount of skin had been removed, but the fascia underneath saved, than when less skin was taken and a very free dissection of the superficial and deep fascias was made. He believes that skin nodules are developed from extension along the lymphatics in the fascia, and not from those in the skin itself, and urges a wide dissection of the superficial and deep fascia, beginning in the axilla, extending down over and including the pectoral muscles from the sternum outward over the muscles of the back and downward, including the fascia of both recti.

We have a large wound to close. On the chest, the cut ends of the pectoral muscles and the intercostals are exposed; below, the external oblique and recti; posteriorily, the latissimus dorsi, the teres major and subscapularis muscle, the subscapular nerve; on the inner aspect of the axilla, the nerve of Bell, and the digitations of the serratus magnus muscle.

Closure of the wound is begun where it was started, near the clavicle. Closure of the oval is begun at the sternal end. After advancing one-third of the distance it can be determined if the flaps can be approximated readily. If this is impossible, the axillary portion of the large wound is closed advancing one-third of the distance. The central one-third, which cannot be approximated, is covered by Thiersch grafts, taken from the thigh of the patient.

We do not employ drainage, except in fleshy persons or when there has been any undue amount of trauma, and we rarely are troubled by serum. The arm is released after twenty-four hours, and passive motion and massage are begun early.

THE SURGICAL RELIEF OF INCREASED INTRACRANIAL PRESSURE

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Increased intracranial tension, whether produced slowly or suddenly—the result of trauma, of new growth, of inflammation or of some congenital deformity, gives rise to circulatory disturbances in the brain. Slight increase of tension causes venous congestion, increasing in severity and extent as the pressure rises. Irritative signs and symptoms may occur when this disturbance affects the non-silent areas of the brain. A still higher degree of intracranial pressure leads to cerebral anæmia, due to compression of the capillaries, with complete loss of function in the area of the brain involved. The blood in the veins is unable to back up into the capillaries or to escape into the sinuses which are narrowed and compressed.

Increased intracranial tension may remain more or less localised, or it may rapidly or slowly become general. Localised pressure is the result of some local compression force, such as a depressed fracture, extradural hæmorrhage, etc. The anatomical arrangement of the falx cerebri and the tentorium cerebelli not only gives support to the contiguous brain surfaces, but they play an important part in localising increased tension to the lobe or area primarily involved. This protecting influence is especially true of the tentorium, in that it guards the vital centres in the medulla from supratentorial encroachment in the cranial cavity.

General pressure, on the other hand, produced by subdural hæmorrhage, or acute obstructive hydrocephalus, etc., soon gives rise to the major signs of increased intracranial tension, signs that the medullary centres are being interfered with.

The normal intracranial pressure is that of the veins and of the cerebro-spinal fluid. Cushing has demonstrated that the cranial cavity can harbour a foreign body one-tenth to one-eighth the size of the brain without producing the major signs of cerebral compression. This is due to the gradual increase of the body in a part of the cranial cavity which does not interfere with the escape or rapid absorption of cerebro-spinal fluid. On the other hand, a small subtentorial growth obstructing the aqueduct of Sylvius may give rise to a very rapid increase in tension. Sudden compression, on the

other hand, such as is produced by deformation of the skull—the result of a severe blow on the head—causes a sudden increase of intracranial tension with capillary anæmia, involving chiefly the supratentorial region. This condition we call concussion. The effect of compression applied so suddenly gives no time for cerebro-spinal fluid to escape or for the venous outlets to become narrow, to compensate for the sudden diminution of the cranial capacity, so the rapidly developed tension applied to the solid and fluid cranial contents affects the capillaries chiefly. This anæmia mainly involves the supratentorial capillaries, but when very severe force has been applied the medullary centres may be equally involved and death from concussion takes place.

Trauma may give rise to temporary compressing effects as in simple concussion, from which the circulation of the brain may sooner or later recover, or it may produce permanent compression (until relieved by surgical treatment) in different ways, viz. depressed fractures (extradural, subdural), pia-arachnoid hæmorrhages, contusion and laceration of the brain tissue with associated intracerebral hæmorrhage, and later on encephalitis and œdema of the brain. Each of these compressing factors disturbs the cerebral circulation and produces venous congestion, capillary anæmia and an accumulation of fluid in the perivascular spaces, and arachnoid tissue —œdema of the brain. This latter condition leads to further venous congestion and still further œdema, so that a vicious cycle is established.

Normally the perivascular spaces drain their fluid into the subarachnoid tissue to mingle with the cerebro-spinal fluid secreted by the choroid plexuses. This fluid escapes from the ventricular system through the foramina of Majendie and Luschka to fill the various cisternæ situated at the base of the brain, and the cerebro subarachnoid tissue, from which it is absorbed largely by the venous sinuses. Anything which interferes with the escape of fluid from the ventricles, or prevents its flow through the cisternæ and subarachnoid tissue and its subsequent absorption and escape from the cranial cavity through the sinuses, increases the intracranial tension.

Retention within the ventricular system from any cause gives rise to obstructive hydrocephalus, the signs and symptoms of which vary according to the age and condition of the cranial sutures. In the unyielding skull this form may rapidly produce the major symptoms of cerebral compression.

In the communicating variety of hydrocephalus, where there is either an increased secretion of cerebro-spinal fluid or a diminished

absorption, due to obliteration of the cisternæ from inflammatory exudate or organising blood clot, etc., the result on the intracranial tension is simliar to that in the obstructive variety.

The experimental studies on cerebral compression, and on the secretion and absorption of cerebro-spinal fluid and the interrelation of these to blood pressure, by Leonard Hill, Horsley, Halliburton, Cushing, Frazier, Mott, Weed, Dandy, Blackfan and many others, have added in recent years much scientific knowledge to what had been taught by the pioneers in this subject.

Their labours have already yielded wonderful practical results in dealing with increased intracranial tension, arising from trauma, new growth, inflammation or congenital deformity.

Phenolsulphonephthalein injections given by lumbar puncture, or by intraventricular injections as taught by Blackfan and Dandy, can differentiate obstructive from communicating types of hydrocephalus, and further, by the examination of the urine, whether in the latter form the disturbance is due to hypersecretion or to diminished absorption of cerebro-spinal fluid. Their studies have at least shown why callosal puncture, drainage of the ventricle and other methods of treating hydrocephalus have failed to give satisfactory results in the past.

Frazier and Peet have demonstrated that many substances may have some influence in increasing the flow of cerebro-spinal fluid, but that up to the present, one alone seems to have the power of diminishing choroid secretion, viz. thyroid extract. Ligation of both carotid arteries fails to diminish cerebro-spinal fluid secretion, and hence this procedure has no place in the treatment of hydrocephalus.

Headache, vertigo, vomiting, drowsiness and mental lethargy are early signs of increase of intracranial tension. These evidences of venous congestion are very often and quite early reflected on the eye grounds. Ophthalmoscopic examination of the retinæ should form a routine part of the examination in every case of suspected cerebral compression. In local compression, becoming widespread or general, a distinct difference in the severity of the venous engorgement and stasis in the retinal vessels in each eye may be made out by the oculist, whose services and advice should always be obtained.

Horsley, years ago drew attention to the importance of ocular examination in cerebral compression and the urgent necessity of saving vision by a decompression operation, since papillœdema and optic atrophy due solely in these cases to venous and lymph stasis, if unrelieved, result in permanent blindness.

But papillœdema may be absent in tumours, traumatic lesions,

and particularly in marked œdema of the brain, so frequently seen after or complicating traumatic lesions, and as recently reported by Rawlings in "heat effects," in which the wet brain was demonstrated by subtemporal decompression and opening the dura, although in some of his cases lumbar puncture failed to reveal excess of fluid or high tension. Rawlings thought this was due to some interference with the normal channels of communication connecting the subarachnoid tissue of the brain and that of the spinal cord.

Every surgeon has noted the uneventful convalescence following compound fractures of the skull, in which free bleeding and oozing of clear fluid have occurred, particularly the absence of persistent posttraumatic headache, dizziness and mental lethargy, inability to concentrate attention, loss of memory; whereas simple fractures with concussion, and it may be with slight evidences of increased intracranial tension, treated in the usual way by rest, careful dieting and an ice bag, have been followed by annoying and often persistent headache, nausea, vomiting, etc., etc.

Is it possible that operative treatment would benefit such cases? And are these late symptoms due to persistent disturbance in the circulatory system and in the escape of cerebro-spinal fluid? Does œdema of the brain give rise to organic changes in the perivascular spaces and in the avenues of escape of the cerebro-spinal fluid?

The major symptoms of cerebral compression arise when the intracranial tension begins to approach that of the blood pressure. These symptoms are a gradually increasing blood pressure, with disturbances in respiration of the Cheyne-Stokes type, and less constantly, though usually present, a slowing of the pulse.

Cushing has shown that these symptoms depend upon capillary anæmia of the medullary centres, the result of which is to stimulate the vasomotor nuclei, causing a rise in blood pressure which overcomes the threatened or actual anæmia in the bulb. If the vasomotor centre, either from exhaustion or protracted anæmia, fails to respond, respiration suddenly stops, but the heart continues to beat for hours if artificial respiration is maintained.

A steadily rising blood pressure, with disturbance of the respiratory centre and slow pulse, demands immediate surgical relief. In this advanced stage decompression may not always be successful even when blood enters the capillaries, because the vasomotor centre has been exhausted and will not respond to the return flow of blood.

The surgeon must keep these physiological and pathological data in mind when called upon to give relief to increased intracranial tension. As Elsberg says, "I believe that in our operations for cerebral

and cerebellar decompression we have given too much thought to the method of the operation and too little attention to the principles upon which such decompression should be based."

Nature has demonstrated for ages how increased tension can be partly relieved in the infant with hydrocephalus. The removal of a large or small portion of the skull and radially cutting the dura imitate this procedure in the unyielding adult skull. Every cerebral tumour is not necessarily associated with marked increase in the intracranial pressure. Its presence is shown chiefly by the local symptoms or by disturbances of cerebral or cerebellar function. On the other hand, the early, if not the earliest, signs of a tumour may be those associated with gradually but rapidly increasing general tension due to obstructed outflow from the ventricles. Whatever tension existed in the first case could only be relieved by removal of the growth or by enlarging the brain space. A decompression in the second case, if the tumour is not operable, would not only be useless but positively harmful, whereas a permanent fistula between the ventricles and subarachnoid tissue would or might be followed by temporary or permanent relief.

In many instances decompression is only a palliative procedure to relieve headache, vomiting, and above all, optic neuritis, just as a gastro-jejunostomy relieves the symptoms of pyloric obstruction of cancerous origin.

Elsberg gives the following indications and contra indications for decompressive procedure:

1. In expanding lesions of the brain, where localisation is impossible, but the sufferings of the patient are great and the danger of blindness imminent.
2. When the lesion has been localised, but from its nature or location cannot be removed, and is causing marked increase of intracranial pressure.
3. When the symptoms are due to a congenital or obstructive hydrocephalus.
4. Acute intracranial conditions, associated with œdema of the brain.

He does not operate in cases with extensive paralyses or where the patient is already blind, but has few or no other symptoms, nor does he think much benefit accrues in nephritis with œdema of the brain and optic neuritis. He refers to Kocher's recommendation of a decompressive craniotomy over the motor area for epilepsy, but does not think the operation has been of value.

The methods at our disposal to relieve increased tension are:

1. Craniotomy, which may be a so-called decompressive craniotomy, or it may call for the elevation of depressed bone; the removal of extradural or subdural clot or of fluid blood; the removal of intracerebral blood clot as in apoplexy; or even from the ventricles; or for the relief of an œdematous brain.
2. Lumbar puncture.
3. Puncture of the ventricles.
4. Puncture of the corpus callosum.
5. Sellar decompression.

(1) Lumbar puncture may relieve intracranial tension. The normal pressure varies from 60 mm. to 100 mm. of water or from 5 mm. to 7.3 mm. of Hg. As already stated, Rawlings, and others have found a high intracranial with a low spinal pressure.

Repeated aspirations have been employed to relieve hydrocephalus. It should never be used to relieve tension in subtentorial tumours unless a wide opening exists in the occipital bone, on account of the danger of herniation of the cerebellum into the foramen magnum and sudden medullary death (Elsberg).

Willems and Albert (*Int. Abst. Surgery*, Feb., 1918, p. 119) recommend it in concussion and in basal fractures to relieve headache, vertigo and vomiting; and repeated tappings to relieve cerebral hernia.

Frazier and others find its chief value in reducing intracranial pressure after craniotomy, but before opening the dura when tension is high, and also in cerebral operations when the protruding brain renders closure of the dura difficult or impossible.

(2) Ventricular puncture is easily performed in infants through the lateral angle of the anterior fontanelle. Permanent drainage has been more or less successfully carried out by means of silkworm gut, metal tubes and strands of silk, one end of the strand or tube lying in the ventricle and the other in the subdural space. Ventricular puncture is of great value in relieving tension during the progress of an intracranial operation.

Keen chooses a point one and one-quarter inches above and behind the upper margin of the auditory meatus. At this point a small button of bone is removed and a slit made in the dura. A blunt needle is directed towards a point two and one-half inches above the external meatus of the opposite side. The ventricle is usually entered at a depth of two and one-half to three inches in this line.

Elsberg, however, recommends Kocher's method because the depth of the ventricle is greater than the width. The site chosen is that

employed in performing puncture of the corpus callosum, and the needle is directed downwards and slightly backwards, and enters the ventricle usually at a depth of from five to six cm.

(3) Puncture of the corpus callosum was devised by Anton and von Brahmann in 1908, and was indicated, they believed, in internal hydrocephalus (obstructive), in tumours with associated hydrocephalus, either as a preliminary step to relieve tension before removing an operable growth or for permanent drainage in inoperable tumours.

Choose a point one to two cm. behind the coronary suture and the same distance from the mid line. Incise the scalp and remove a small button of bone. Open the dura just outside the lateral margin of the superior longitudinal sinus. A flexible canula with one or two lateral openings and a slightly bulbous end is suitably bent to facilitate its introduction into the superior longitudinal fissure along the side of the falx cerebri. When the canula is arrested by the corpus callosum the stilet, which is used with the canula, is withdrawn and the instrument is forced through the corpus. Successful puncture is evidenced by a flow of clear fluid. Before withdrawing the instrument, the opening in the roof of the ventricle is enlarged antero-posteriorly (not laterally) by bluntly tearing through the fibres of the corpus. On withdrawing the instrument, suture the dura and scalp separately.

The permanence of this fistula depends upon the increased ventricular tension over that in the subarachnoid tissue.

Decompressive Craniotomy

This is employed to relieve pressure in inoperable tumours and in growths which cannot be located. Sufficient bone must be removed to relieve the tension, and in all cases the dura should be radially incised or excised. Callosal puncture, in many of these cases, has obviated the great disfigurement from the resulting hernia, to say nothing of the post-operative paralyses which not infrequently follow an extensive decompressive operation. As already stated, Frazier has emphasised the importance of recognising obstructive hydrocephalus as the chief factor in producing tension in many of these cases, and of the value of callosal or ventricular puncture in relieving it.

When decompression is necessary it should be performed over a silent area and the protruding brain should be protected by muscle and fascia.

Cushing's subtemporal decompression to relieve pressure in the cerebral hemispheres, and suboccipital decompression to relieve tension below the tentorium, are the methods of choice.

Neither time nor the requirements of this contribution allow for a description of the surgical treatment of depressed fractures, epidural, subdural, pia-arachnoid or intracerebral hæmorrhage, although each of these conditions, singly or in combination, accounts for the initial disturbance which gives rise to increased tension. Adequate treatment calls for the elevation of the depressed bone, the arrest of bleeding, the removal of fluid blood or blood clot from the epidural and subdural areas and, if it can be located, from the interior of the brain. Ventricular puncture will reveal blood in the ventricles when present.

Sinoventricular puncture, as devised by Dandy experimentally, so far as I know, has not been subjected to the test of clinical experience.

Haynes in 1912 advised drainage of the cisterna magna for the surgical treatment of meningitis, and in 1913 proposed and carried out drainage of the cisterna magna into the occipital sinus by means of a small rubber tube, for hydrocephalus.

Payr in 1908 announced a method of draining the lateral ventricle, in obstructive hydrocephalus, into the superior longitudinal sinus by means of a portion of the long saphenous vein.

Each of these three methods depends upon the greater pressure and lower specific gravity of the cerebro-spinal fluid as compared with the blood in the sinuses, so that when an artificial communication is made, there seems to be no tendency for blood to flow from the sinuses either into the ventricle or into the subarachnoid space.

Sellar decompression for the relief of pressure in new growth of the hypophysis is more or less in its developmental stage. Kanavel, Lewis, Mixter, Halsted, Cushing and Hirsch have devised and perfected the nasal route of approach through the sphenoid.

Frazier and Elsberg have chosen the transfrontal operation. Elsberg thinks sellar decompression should be done by a skilled Rhinologist, who should have no difficulty in opening the sphenoidal cells under local anæsthesia and removing the floor of the sella turcica.

Cystic collections of fluid outside of the brain are rare and are usually found in the posterior cranial fossa. Some of these are undoubtedly collections of fluid in one of the basal cisternæ.

Krause has applied the term "arachnitis adhæsiva circumscripta" as a proper and descriptive name for this condition in the cranial cavity (page 726, Vol. II).

Such collections give rise to compression symptoms and have been mistaken for tumours, indeed most cases recorded have been diagnosed at the operating table:

Incision with or without drainage through the suboccipital route has given satisfactory results.

THE TRAINING OF THE SURGEON

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The available knowledge relating to medicine has now reached such great proportions no one human mind can encompass it all. Of necessity, specialties have sprung up. Of these specialties, surgery was one of the first to appear, and the range covered is one of the largest, as well in the breadth of matter, as in the number of patients. And it might be interjected here that, after all, the whole science of medicine exists for the patient. In other words, the patient stands preëminent.

As to surgery, surgeons are made, not born. The making process we call education. Education should commence when the child begins to use its hands. It should be taught to use both hands equally well, as nearly as possible. As it grows it should have its reasoning power developed, and its ability to observe and record its observations and its mechanical ability should be encouraged.

Pre-medical training is not yet settled. Should the prospective medical student take a degree in arts? One can scarcely agree that the experience of McGill Medical School is the experience elsewhere. Dr. Adami, speaking on behalf of McGill, and addressing the medical students of Toronto University in 1910 said, "At McGill we have noted, as a common occurrence, that the frequent B.A.'s among our students—of course, there are brilliant exceptions—do but poorly in their first two or three years under us . . . as a rule in their final years these men get into their pace again and do excellently. . . . But, all the same, I believe they have wasted, roughly, a year of their student life."

The experience elsewhere is preponderately in favour of a degree in arts when possible. And if a degree in arts, what is the best course to take? The popular idea is in favour of the natural sciences? One cannot help but think that a course in philosophy would be preferable, providing, as it does, a thorough grounding in reasoning.

The undergraduate course must fill a large place in the training of the surgeon. Furthermore, the training for the coming surgeon during the undergraduate course, should be identical with that of all other medical students. With all our specialties, we must remember that the patient is a unit. The specialty should be begun only after a broad view of the whole is gained. One cannot agree at all with that

renowned English surgeon, Rutherford Morrison, when he said to this association at St. John, in 1914, "The teaching of those students who are to become practitioners should be different in character and more limited in aim than that intended for developing surgeons." It cannot be decided at the commencement of the undergraduate course, in this country at least, who will and will not make a surgeon. All should take the same fixed minimum amount of training. Any very brilliant and industrious student might be allowed to do extra work.

If the position just now taken is tenable, the first thing to discuss is the whole undergraduate course, and, that, both in a general way, and, also, particularly as it applies to the coming surgeon.

There is good precedent for opening up this question of medical training in Canada. Arthur Dean Bevan said to the American Medical Association in 1917, "I believe that the American Medical Association should undertake the task of establishing in some way educational requirements, including a clinical training, sufficiently high to eliminate incompetent surgeons." His words could equally well be applied to the Canadian Medical Association. Possibly the medical schools will show resentment if the profession express their opinions on medical education. Let me quote Alexander McPhedran when he addressed the Alberta Medical Association at Edmonton, in 1911, "That the profession, through their national authorities, have a right to consider the efficiency of the instructors in the institutions sending graduates for license to practise, cannot be gainsaid."

It is probably safe to venture the opinion that there is much need for a careful revision of the undergraduate course in all the medical schools in Canada. With all the additions to the curriculum in recent years, there is grave danger of the students being so busy that they have not time to think. And an all-important feature in the practice of medicine is *thinking*. There might, with profit, be some subtractions as well as additions, and also a readjustment of the proportion of time spent on the various subjects. The time spent on, say anatomy and physiology, with their respective kindred subjects, is probably far from right. During two years of the life of the average medical student anatomy absorbs about 50% of his time and 60% of his energy.

In the senior years there is a tendency to divorce the laboratory work from the wards, where lies the object of the whole thing—the patient. This also exists, to a certain extent, possibly, during the junior years. The laboratory is most valuable as an adjunct, but it should not be elevated to a place of independence. McPhedran's words are very applicable, "Few of us can do much in the way of laboratory research,

but the opportunity comes to all for careful observation in ill people and of accurately recording these observations."

In the undergraduate course, then, after anatomy and physiology (with their kindred subjects, histology, pathology and physiological chemistry) are taught, the major part of the work ahead is that of learning to make a diagnosis. Next in importance come obstetrics and the feeding of infants. After these come infectious disease, dermatology, neurology, and genito-urinary disease, materia medica and hygiene. The primary years should be built up on the basis of the above. The custom of some men of considering that anatomy and physiology should be taught as self-contained subjects, is indefensible. These subjects must be taught as part of a whole.

Granted, then, that this rough outline of the course is somewhere nearly correct, and that *diagnosis* is not unduly magnified, our problem, as surgeons, becomes, at this stage—How much surgery does the general practitioner, or each one of the specialists, other than the surgeon, need? To make it specific, ask—How much surgery does the ophthalmologist need? Outside of the special features of his own line he needs a working knowledge of the human body as a whole, in health and in sickness, but he does not need to know how to do a gastro-enterostomy.

A careful perusal of the calendars of the eight schools in Canada, which give a course covering the whole work leading to a degree in medicine, reveals some interesting facts.

In McGill, Dalhousie and Queens, the securing of the degree of Doctor of Medicine carries with it the degree of Master of Surgery. If Master of Surgery means anything it should mean that the holder of the degree has special qualifications for practising surgery. These schools probably do not mean that this is the case with every student they graduate.

Manitoba gives a C.M. degree, but on a special examination on surgery alone, on which the candidate must take 75% to pass. This is better. Would it not be still better to change the whole system completely, and give the degree of Master of Surgery to no one but surgeons? But more of this later.

In Western Canada the village gossip thinks the man from the school which compels every man to accept the degree Master of Surgery is a better man than the graduate from some other schools. They think the man with the degree of Master of Surgery is necessarily a surgeon, and that the other one is not. In the long run, however, they learn to know better.

The teaching of operative surgery, during the undergraduate course, is a mistake. This is particularly true when the teaching of surgical

technic is done on the cadaver. A house surgeon, in six months on a good surgical service in a hospital, will learn more real surgery than any student now learns on the cadaver during the whole undergraduate course. Every man does not need operative surgery. Those that will need it in later life should, at this time, be getting up diagnosis and all that goes with it. The direct preparation for doing surgery should begin after graduation.

In the undergraduate course all that should be taught of orthopœdics should be the diagnosis and an outline of what can be done to improve the abnormal condition. Details of treatment should not be taught at all. In genito-urinary diseases the diagnosis should be taught, and, in addition, the treatment of acute gonorrhœa, and a knowledge of the treatment of syphilis should be acquired. The student does not need to be instructed in the details of giving neosalvarsan. Neither should he be taught to use the cystoscope, though he should know how to interpret the findings given him by the cystoscopist.

No more should abdominal or extremity surgery be taught at this time. Any student, with two eyes and a fair amount of grey matter, will be interested enough in, and see enough of, surgery in any well organised hospital. He will get all that he has time for if he gets up the diseases and their pathology. Many a student knows less about inflammation when he graduates than he does about abdominal operations. He is not to blame. We teachers are.

Not only the subject matter, but methods of teaching are open to question. Regarding the clinical teaching of the final years, one agrees with Tinker, who says, "There is always the temptation to present the unusual and rare cases, which interest the teacher, to whom the ordinary disease and injury are commonplace." In the same article he says, "The hours which should be spent in teaching surgical diagnosis are given over to clinics, which are more useful to demonstrate the skill and boldness of their teacher as an operator, than with subjects which would be useful to them in practice."

At this time of specialisation, the teaching in medical schools drifts more and more into the hands of the highly-trained specialist. In time all the teachers will be specialists. Each tends to do the same in his teaching, as is so common in practice, viz. to magnify his particular department often to the extent of ignoring the unity of the patient. If medicine is to preserve a well-balanced proportion, with due regard to the oneness of the patient, the teaching must either be in the hands of specialists who do not forget the above-mentioned unity of the patient, or it must drift back more into the hands of the general practitioner. The latter is not desirable.

In this it will be observed by some that there is no suggested place for surgery whatever. Well what is surgery? If it is only doing operations, then there is surely no room for surgery up to this stage. If surgery includes making the diagnosis, then it is included. And who will say that the major part of surgery is the mechanics, and that the minor part is the making of the diagnosis? Surely the diagnosis here, as in internal medicine, is the beginning point.

After finishing the academic term, no student should be given a license, and possibly not a degree, until he or she had served at least one, and, better, two, years' residence in an approved hospital. All students, irrespective of whatever specialty they may intend to follow, should have this general training in a hospital.

(For men who have got thus far at a fairly early age, say twenty-three or twenty-four, two or three years spent in general practice would be of great value to the surgeon-to-be.)

At this stage the man who wishes to be a surgeon should begin to get the special training necessary to equip him, but not before. He should now spend at least two years more, and better three, as resident surgeon in some well organized teaching hospital, or associate himself with some surgeon of wide experience and good judgment for an equal length of time. Many young men would most gladly spend this amount of time in a hospital if a fair stipend were offered. Safe it is to say that for the second year's residence in hospital the interne would be content with even the pay of the operating room orderly. The young man who is willing to spend all these years in training for highly specialized service for the public, is surely entitled to some financial remuneration during the last years of his training, which years, be it remembered, are full of service to the people.

As the potential surgeon grows in judgment, caution and knowledge, he should have increased responsibility placed on him even to the extent of doing much work himself, first under the eye of his chief, and later, alone. The man must be given a load to carry all by himself in order to make him realize the responsibility a surgeon assumes when in practice on his own account. Any house-man worth the name will not abuse the confidence reposed in him by his chief.

Halsted says, "The faults of our system of educating surgeons begin almost at the bottom and continue to the top. I am considering only the training of the best men, those who aspire to the higher career in surgery. On *graduation,* they become hospital internes, but their term is only one and a half, occasionally two, years, not as long, on the average, as that required of each medical graduate of the

University of Tokio. It is a grave mistake, it is a shame, to check suddenly the advance of these superior young men, who are tense with enthusiasm, who rejoice in the work to which they hope to be able to dedicate their lives. It is from these men, we must not forget, we are to draw our teachers of surgery." Three years spent thus will be vastly more valuable to him than a post-graduate college course with a degree at the end of it.

During this term of interneship, provision should be made whereby work on anæsthetised animals may be done. It is highly desirable that this work be carefully supervised, else it may develop into careless habits. If properly supervised, this is an adjunct that cannot be too highly regarded.

After training is completed, and the man gets out into practice, how is he going to get the necessary cases? Montreal has closed hospitals. Is there any opportunity for the young surgeon to prove that he can "make good"? Surely the custom in Montreal is too conservative. There is in that policy very little that offers an open door to a hard-working, well-trained young surgeon. Winnipeg has the "open-door" policy whereby any man can operate on a private patient when he can find one. This policy gives opportunity to the young surgeon. It is, at the same time, open to grave abuse. Stewart rightly observes, "Recent medical graduates rush in and do major surgery, their first attempt at an abdominal operation being saved from fatal results by the grace of God and access to a clean operating room." The open door must be carefully guarded by a board of management, guided by a superintendent with a conscience, so that surgeons, but none other, are allowed to operate.

In conclusion, it is respectfully suggested:

1. That there should be an agreement among all the medical schools in Canada on the general principles regarding the teaching of surgery;

2. That the C.M. degree, as it now stands, should be abolished;

3. That a new degree be established, with the same or a similar name, to be based largely on work actually done, rather than on a formal examination only.

4. That for the present this degree be granted not sooner than four years after graduation, and that, by mutual agreement amongst the Universities of Canada, this time be extended later on to five years.

5. That this surgical section of the Canadian Medical Association take the initiative in the matter of setting requirements for surgeons. This could possibly be done by working in conjunction with the American College of Surgeons, to which a goodly number of Canadians belong.

FRACTURES OF THE NECK OF THE FEMUR

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Fractures of the neck of the femur are the most disabling to the elderly, and constitute one-third of all the fractures in people more than seventy years of age. There has been handed down to us one hundred years of tradition, due to the teachings of Sir Astley Cooper, that bony union is a rarity following such a fracture, and that treatment, particularly of the subcapital or so-called intracapsular fracture, is well nigh hopeless. Such teaching has produced, to say the least, a cursory type of treatment, with disastrous results. Occurring, as such fractures often do, in old age, many persons end their days in pain and suffering when they might have had days of comfort and peace. While it is my intention to discuss here chiefly the treatment of ununited fractures, the difficulties and disappointments encountered prompt me to emphasise the necessity of their adequate primary care.

The current medical literature of recent years has, from time to time, contained excellent papers calling attention to the success that may be expected to follow treatment based on a sound pathologic knowledge of the fracture under discussion. Because in isolated instances elderly persons have died following fractures of the hip, an exaggerated view of the mortality rate has been held. Whitman cites statistics from Bellevue Hospital, New York, showing that in 241 consecutive cases treated in three years there were but three deaths, one within twenty-four hours, which may have been due to fat embolism, and two due to alcoholism and nephritis. These figures show that as a group, such patients are entitled to active treatment, instead of the "let alone" method which is almost sure to give poor results.

Fractures of the hip may be produced by muscular action or some slight jar or jolt, such as slipping off a curb or a low step. Fractures happening in this manner are found in the aged, although occasionally seen as the first manifestation of a Charcot joint in young persons. Close questioning in the latter cases may be necessary to elicit the information that the hip seemed to give way, causing the fall, that is, the fall was caused by the break and not the break by the fall. The majority of fractures of the hip are, however, produced by direct violence, usually by a fall on the trochanter.

As a basis for this communication 165 consecutive case histories of patients coming to the Mayo Clinic for fracture of the neck of the femur have been studied. There were sixty-six females and ninety-nine males. The ages of the patients at the time of accident varied and showed that the condition is by no means confined to the elderly. There were eleven between 10 and 20 years, eighteen between 20 and 30, twenty-seven between 30 and 40, twenty-six between 40 and 50, fifty-one between 50 and 60, twenty-four between 60 and 70, five between 70 and 80, three between 80 and 90. A large majority of the series had old, ununited fractures; the patient coming for treatment three or four months or as many years after the accident. The number emphasises in general either that the treatment of fractures of the hip is very poor or that the condition is a very difficult one to treat. Because of the great length of time that had elapsed between the accident and our examination, it was impossible to determine whether the type of fracture was originally subcapital (intracapsular) or trochanteric (extracapsular). The impression was gained, however, that it is not alone the subcapital type in which there is non-union. If it is true that a fall from a height on the feet produces a fracture of the neck of the femur of the subcapital type, and that an injury in which the force is applied directly to the trochanter, as in a fall on the hip, produces a trochanteric type of fracture, then many of these cases of non-union must have followed the trochanteric type of fracture. After the accident, there is pain and disability, usually total, shortening and eversion, and the trochanter and upper part of the femur sag to a more posterior plane than the same region of the opposite leg. The problem the surgeon is confronted with is to reëstablish normal length, correct the eversion and raise the trochanter forward, and once these conditions are fulfilled, to hold the corrected position. It is the last requirement which has brought out the different methods of treatment.

Brief mention will be made of four methods any one of which, properly carried out, will give good results in fractures of the neck of the femur, be the fracture subcapital (intracapsular) or trochanteric (extracapsular). One hundred per cent. good results cannot be expected, since no surgical procedure gives such a percentage, but the cases show that very much better results can be obtained by these methods than by any other.

The outstanding features of a review of our case histories were that in a great many instances the diagnosis was not made until too late for efficient primary measures, and that even when the diagnosis was correctly made, the treatment accorded as a whole was woefully

inefficient. Many had no treatment at all, a diagnosis never having been made. Following the accident there may have been a weak impaction disguising the symptoms; repeated examinations were not made subsequent to a diagnosis of sprain; the impaction broke down and only when too late did the examination, most often by another physician, disclose the typical signs of fracture of the hip.

In all our textbooks runs the warning against breaking up a so-called impacted fracture, and perhaps no one rule has done more to cause many poor results. Once the term impacted is applied to the case, it gives all concerned a sense of unjustified security. It is most difficult to tell whether a fracture of the neck of the femur is securely impacted. Whitman describes this very well when he says, "What passes for impaction is usually a fracture with but slight displacement; clinically a case in which shortening is slight, in which crepitus is absent and in which some control of motion or even capacity for weight bearing is retained." It is best in every case that the impaction should be broken up, and this is advised by such authorities as Jones, Whitman and Ruth.

In 1869 Dr. Philip of Dixon, Illinois, first used what is now known as the Ruth-Maxwell method. Dr. Maxwell advocated it and following him, Dr. C. E. Ruth, both preferring to call it the anatomical method. Ruth advises, as the first step in the treatment, flexing the thigh, thus permitting disengagement of the fractured surfaces. The leg should then be forcibly straightened, the traction being persistent, strong and steady until the normal length is secured. The eversion should be corrected and the trochanter forced up to its proper place, when a Buck's extension should be applied with a weight of twenty pounds for the ordinary individual. A binder's board or fibre should be moulded to the inner and upper side of the thigh over which a band of muslin four to six inches wide should be passed outward, slightly upward and sufficiently forward so that the weight of this counter-extension overcomes the internal pull of all the rotators and adductors, and at the same time raises the lower fragment to its normal level. This weight varies from five to fifteen pounds. If in addition this method is further modified so that the leg is kept in abduction, better coaptation of the fragments is insured. Whitman states that Ruth has modified his treatment in this manner, thus accepting the position of abduction as an aid to the treatment.

The method advocated by Whitman is based on the fact that if a fresh fracture of the neck of the femur is reduced and the limb placed in the normal position, reëstablishing length and overcoming the external rotation and backward displacement of the trochanter, the

fractured surfaces may very readily be held in this relation by abducting the hip to an angle of approximately 45°. This is the extreme abduction normally permitted, and it forcibly impacts the fractured surface of the neck against the fractured surface of the head of the femur. The exact method, according to Whitman, is as follows: "The patient having been anæsthetised, is lifted to a sacral support, the shoulders resting on a box of equal height while the extended limbs are supported by two assistants. The assistant holding the sound limb, then abducts it to the anatomical limit to illustrate the normal range, which varies in different individuals and at different ages, and, incidentally, to fix the pelvis by direct bony contact. The operator first flexes the thigh of the affected leg to disengage the fragments. The assistant then extends the limb and by manual traction overcomes the shortening, as demonstrated by the relation of the trochanter to Nelaton's line and by measurements. He then rotates it inward, and, under traction, abducts it to the normal limit, the operator meanwhile lifting the thigh and trochanter from beneath. Inspection should now show absolute correspondence between the extended limbs as to abduction, rotation, length and position of the trochanter. In this attitude the injured part is securely fixed by a plaster spica extending from the nipples to the toes." Patients treated in this manner may readily be moved and their position in bed altered, as the extreme abduction absolutely prohibits any motion of the fragments and does not permit joint fluid to find its way between the surfaces.

Cotton in his method uses practically the same procedure, except that after he has broken down the impaction and reduced the fracture, he aims to firmly impact the fragments with the leg in abduction by hammering on the trochanter with a padded mallet driving the outer fragment into the inner. With this accomplished, he uses a plaster of Paris cast to hold the position.

Sir Robert Jones applies the same anatomical principles, but uses his abduction frame to control the fragments. In his skilled hands it is an excellent fixative apparatus, but attention is necessary to see that no kind-hearted but meddlesome attendant loosens a strap or changes the position of the patient in the attempt to make him more comfortable, so that fixation is altered and mischief done. Following such treatment it is necessary to maintain fixation of the fractured surfaces for three months, and to not permit any weight-bearing for six months. These methods may be considered as conservative surgical measures, and the cases reported by their originators show that bony union with normal functionating limbs can be obtained. In skilled hands and with careful technic there can be no doubt that an

open operation and the placing of an autogenous or heterogenous bone peg through the trochanter and neck into the head of the femur, followed by adequate fixation, would give excellent results, but the results in fresh fractures are so good by the former methods that more radical procedure is not necessary.

In the large number of patients with ununited fractures of the hip observed in the Mayo Clinic, radical surgery has been resorted to in thirty-three. The ages of those operated on were as follows: One between 10 and 20 years, three between 21 and 30, nine between 31 and 40, seven between 41 and 50, eleven between 51 and 60, and two between 61 and 70. Nine were females and twenty-four were males. There were no deaths. The number is too small satisfactorily to draw conclusions from any statistics that might be compiled, therefore the present report can only be of value by somewhat abritrarily stating conclusions based on clinical observations. Various measures were adopted. In a number of cases nails and screws were used. The attempt to place these without exposing and freshening the fractured surfaces practically means failure, and was early abandoned, and even after freshening the surfaces the final results were poor. The last seventeen patients were subjected to some form of bone grafting. The bone peg has been employed in four ways—

1. As an autogenous peg taken from the patient's tibia on the affected limb, and, after freshening the fractured surfaces, placed through the trochanter and what was left of the neck into the head of the bone.

2. As smaller autogenous grafts wedged in between the fractured surfaces. A piece of bone five or six inches in length removed from the tibia was sawed into three pieces which were placed either vertically or horizontally between the fractured surfaces and wedged firmly between the fragments by placing the limb in abduction. It was hoped in this manner to restore at least some of the absorbed neck of the bone.

3. As heterogenous bone pegs obtained by taking the femur of the beef and turning out on the lathe threaded pegs of suitable size.

4. The fibula used, according to the advice of Davison, as a peg.

In nine cases in which the bone graft was tibial and autogenous, used either as a large peg or as multiple small grafts, there were but two successes. At first it was thought that failure was due to inadequate fixation in that it was not prolonged enough, but even after three months' fixation the peg broke, and most of the pegs broke while the cast was still being worn. In no case was there any evidence shown in the Roentgenogram that the graft increased in size to

take on function. On the contrary, the graft atrophied and broke where it bridged the fracture line. As these grafts were all cortical bone, and were placed in cancellus bone, we believed that they were gradually replaced by bone natural to the situation, and that in this process of substitution the pull of the powerful muscles on the lower fragment, even when in a cast, was sufficient to break the weakened graft where it crossed the fracture line. We have used the fibula in six cases with three successes. It has advantages over the other grafts in that it is large, strong, and has the full thickness of bone. The entire thickness of the fibula of the desired length is removed, usually at the juncture of the lower with the middle third. The removal is done subperiosteally as much as possible, and before the bone is used as a peg, the remaining muscle tags and periosteum are removed. The bony defect in the fibula does not completely regenerate, but causes no inconvenience to the patient, and function is perfect. The beef peg has been used four times with two successes, but it is only fair to state that these two were especially favourable cases for operation, and bony union probably would have resulted without the operation although not so rapidly. From our experience we are inclined to discard the use of such a peg in old ununited fractures, particularly in elderly persons. If operation is advised in a recent case or in a young person, a beef peg would be quite suitable.

In our work we have used the approach advised by Murphy, that is, the curved incision over the trochanter with the broad base upward and the bottom of the U passing across the femur two inches below the tip of the trochanter. On reflecting this flap upward the tip of the trochanter, with its attached muscles, is either sawed off with a gigli saw or chiseled free and also reflected upward. Ready approach to the neck of the femur is then secured. The fractured surfaces are exposed and freshened, and whatever means the surgeon prefers is used to hold them together.

The results of our efforts in these thirty-three cases were disappointing, there being seven successes and twenty-six failures. The operation step by step is not difficult but taken as a whole, consisting of the exposure, the freshening of the bony surfaces, the placing of the graft in such a way that it is at a mechanical advantage, the holding of the position while the wound is being closed and the fixation, usually plaster of Paris, is applied, devolves considerable difficulty on the surgeon, making the entire operation somewhat formidable. In some cases the failure was undoubtedly due to faulty technic, poor placing of the nails, screws or bone grafts; in others the fault probably lay in poor post-operative fixation.

While in the main our results were disappointing, we had some successes. It must be remembered that as a group these patients had nothing to look forward to but continued disability, and the attempt was justifiable. From the experience gained we could probably obtain better results in the next thirty-three cases. The selection of the cases for operation is most important. The more of the neck of the femur that is absorbed, the poorer the chance of obtaining bony union by surgical measures. The older the patient, other things being equal, the poorer the prognosis. An older patient might, however, offer better chances for surgery if more of the neck of the femur were present than would a young patient with no femoral neck. One of our patients, a young woman twenty-five years of age, in six months after the accident, showed complete absence of the neck of the femur, and the operation was of no benefit.

The poor showing of our surgical efforts in this group of ununited fractures of the hip serves but to emphasise most strongly the necessity for rational adequate therapeutics immediately following the fracture. If radical surgery must be attempted we would advise, as the result of our experience, that a bone graft, preferably the fibula, be used, though even this procedure is uncertain. Too much emphasis cannot be laid on the necessity of applying proper treatment immediately after the accident, thus not allowing the patient to go on to the most distressing condition of non-union.

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THE CANCER PROBLEM

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Through the study of comparative anatomy and embryology the anomalies of life have only recently become easier of explanation. It is shown that each life higher in the scale of evolution is subject to anomalies such as would be normal to some life lower in the scale. Certain additional forms accompany the changes from invertebrate to vertebrate. Within these two groups may be found the explanation for most of the anomalies, the cause in some being a chemical one—a change in the salts of the amniotic fluid, or of the solution in which the egg is developed. Is it not possible that the cancer problem may in time be worked out in all its details on the basis of primitive life? In truth, we advance far by the harmonious assembling of facts made known by many observers and writers.

Unicellular life of both animal and plant type divides the cell, and with it the cell intelligence for type and habits. We find that microbes may be changed from one to another of the same species by change in the oxygen tension, showing that variations of these organisms may occur with but little change from natural conditions. The polar bodies, centrosomes and chromosomes, do not occur in the unicellular organisms as found in the cells of multicellular organisms, and while unicellular growth is parasitic, increasing as long as food can be obtained and environment permits, in multicellular life each cell must be controlled for community existence and harmony of work, and the controlling agents are the chromosomes and centrosomes. Probably the centrosome represents the dynamic power as suggested by Wilson.* Cancer is created in some manner by the division of one cell failing to carry with it the centrosome, the next division leaves it without control as a unicellular type of life, capable of lawless growth more or less true to type but without a controlling brain. In reversion of type the cell becomes parasitic in existence, creating nests of cells, funguating growth, ulceration and degeneration of connective tissue according to the location, tissue and blood supply and reaction to irritation, and primarily changing the local field into a slightly acid one as an environment suitable for its growth. Ultimately this fluid permeates the body, a curious cancer cachexia occurs, and with it

*Wilson, E. B. The Cell in Development and Inheritance. New York, Macmillan, 1911, 483 pp.

there may be metastases, later becoming manifest by growth at any point where cells may be carried. Before this it occurs in adjacent local lymph glands permeated by the fluid, and cancer grows freely in them. It is this need for proper chemical fluid environment that explains why cancer cannot be transmitted into higher types of life, but can be transmitted in the lower. This explains the metastases occurring in cachexia, the whole body being in an acceptable fluid state.

Cancer continues to be one of the greatest of modern scourges. The disease apparently is on the increase, especially among the more highly civilised races. It may possibly be more prevalent than is suspected among lower types of the human race because of lack of examination and investigation, as has been shown to be the case in cancer of animals such as water buffalo, dogs, chickens and mice and the lower types of life. In this connection, Erwin Smith's work on cancer in plant life is of great interest. He has shown many plant tumours as being due to bacteria and insect irritation and he has been able to reproduce and transplant certain tumours which compare in malignancy with those of animal cells. He also predicts almost the localizing position of the cancer by use of certain irritants injected with the cancer cells.

In cancer there is a local lawless cell growth. There must be, then, either a local cell fertilizing agent or a local loss of control over cell growth, and the study becomes one of the individual cell, the actions of which are best observed in early cell life. After maturity is reached there are few structures capable of cell growth, yet the thyroid, a dynamic organ controlling energy output, is subject to hyperplasia, and the liver, a most necessary organ, is subject to regenerative growth.

Discussion, investigation and discoverey have been the means of controlling other great life-destroying diseases and have been most helpful in the control of cancer. Statistics show a marvelous improvement in the control and care of tuberculosis, and of pneumonia, while cancer, apoplexy, nephritis, and diseases of the heart have all been increasing. The greatest advance, however, in our knowledge of disease has come from a study of the individual cell. MacCarty's investigations tend to show that the disease begins in the waiting or immature repair cells, which replace the active or protective epithelium, or the secreting cells, and not the mature cells. The necessity for over-activity of these resting cells by the stimulation of continued traumatism and the destruction of mature cells may be an important factor in the local origin of cancer. Thus rapid development and lack

of control with migratory hyperplasia would place such cells within the cancer classification. The cell's intelligence for growth carries on progressive activity, the half of each active cell becomes the new cell, continuing its intelligence. Some investigators believe that a fertilising agent of nucleated cells gains entrance to local areas through traumatism, and should a single cell become fertilised, cancer may develop. It is believed by some that the fertilising agent of a cell is water-borne, and with some stretch of the imagination we bridge provoking difficulties of type, form and location in a study of the cause of cancer. The biochemic theories of cell development are also advanced. The effect of cholesterol on the cell is being investigated. Educational propaganda has been of incalculable value in the prevention of cancer by early treatment, by the removal of benign tumours, and by the avoidance of irritation. It is probable that there are continually 200,000 people in this country suffering from the disease, and approximately 80,000 die each year of the disease.

While cancer may be found at any age, it does not commonly occur in persons under thirty-five years and it rarely occurs in persons under twenty years, when natural cell activity might be presumed to be a factor, and its disturbance would more readily develop uncontrolled growth. The resistant influence of youth may lie in the rapid reduction and restoration to normal of the acidity necessary to remove the ashes and waste developed in cell activity, and young cells have not exhausted the protoplasmic control bodies. In old age with hardening of the tissues, it is easier for a centrosome to partially or wholly fail in its material. If so, then will be the skin changes, seen in the old precancerous conditions, becoming cancerous when one cell utterly fails in its control. Thus cancer would originate in one cell reverting to primitive life. The chemical change is naturally much slower in degenerating tissue or in the normal degeneration of advancing age.

In considering this chemical theory of cancer as influencing vicious cell growth, it is noted that of the cancers affecting man, 38% in men and 22% in women, are found in the stomach where acidity is constant and high, as compared with other tissues. In ulcer, the gastric secretion is high in free acid. When cancer develops, combined acids increase and free acid diminishes or disappears, and the activity of pepsin is reduced or destroyed, regardless of the presence of combined acids. In accordance with this hypothesis peptic ulcer and cancer would occur but rarely in the non-acid achlorhydric stomach, since destructive growths and destructive bacteria are most harmful in the acid environment. The duodenum, which by right of continuity of tissue and close association, and opportunity for graft-

ing from cancer of the stomach, is far more commonly affected by ulceration than is the stomach, but it is rarely affected by cancer, which nevertheless, may spread from the stomach into all other tissues and structures surrounding it and also at distant points in the abdomen. Ulcers occur in the stomach about one-third as frequently as in the first portion of the duodenum. A large percentage of gastric cancers give a history of preceding ulcer. Ulcer, then, is more common in the naturally alkaline duodenum, which is periodically bathed with the acids from the stomach. The neutralising process occurs in the first portion of the duodenum. Ulcer or cancer is very rare in the duodenum below the first two or three inches, although cancer occasionally occurs in this organ by penetrating through a duct. Cancer occurs but two times in the whole length of the alkaline small intestine to ninety-eight times in the large bowel. The colon is frequently affected by cancer because here again there is acidity, and 75% of cancers are located in the fixed and tissue-surrounded portion of the colon, which retains the dry and harder contents as a traumatic agent. The same statement may be made concerning the development of cancer in other acid fields, either normal or degenerative, that is, the urinary bladder, the cervix and the mouth. The mammary gland, the uterus and the prostate are subject to carcinoma, being tissues in which degeneration is a normal process and having but a limited period of functional activity.

Ulceration, under proper conditions, may permit cancer to develop. The ulcerative process itself is usually of bacterial origin and the bacteria are carried by the circulation, local conditions of infection being developed through capillary infarctions. It is very probable that the essential factor in the development of carcinoma is a derangement inside of the single cell in an acid field, and that the single cell carried through the lymphatics or into the circulation is the cause of metastasis. In the peritoneum and on the surface grafting is common, and it is occasionally seen in epithelial and mucous surfaces.

It is evident that cancer is on the increase among the more highly civilised people; the enormous percentage occurring in the stomach would indicate that this organ receives the greatest abuse. Many factors concerned with the higher civilised existence probably tend to the increase of cancer and should be a subject for study.

We have, then, in cancer a cell with lost control, destroying its community existence and reverting back to primitive life. It has a natural acid environment or an acquired one incident to local degeneration which may be normal, as in the stomach, or incident to normal degeneration as in the breast and uterus, or the degeneration of age.

The part played by chronic traumatism or irritation in the develop-

ment of cancer is positive and definite to a degree. The danger of cancer is increased by all irritation or traumatism which demands a continued cell repair, and it is in proportion to that demand. Ultimately exhaustion of cell control bodies occurs, modified by age limitations and chemical surroundings. Such areas offer an increasing opportunity for the half of a dividing cell to revert to the unicellular outlaw type of life and to become parasitic and cancerous.

If the cells are involved they must be of the immature or waiting type, and further progress in the study of cancer can come only through a study of the individual cell of the multicellular and unicellular organisms, in order to select more definitely the one or more bodies which may be involved in the control of its protoplasm.

Treatment.

Removal by any method is effective, if early, whether by knife, paste, cautery, rays or radium. Removal of the local growth is not effective if the glands are involved, more extensive dissection being required in addition to gland removal.

The effect of rays may be to lower the permanency of the control bodies of the cell; thus prolonged X-ray treatment without protective shields, for certain types of rays, adds a factor of danger in the production of cancer.

SURGERY OF THE COLON

R. J. McGuire, Buffalo, New York

Some few years ago Lane startled us with his radical views on intestinal stasis. Lane's remarkable dexterity, his really excellent technic, added to his personal charm as a speaker, made many think that some of his theories were based on sound scientific facts. It is not necessary to recapitulate all of his many questionable dictums, such as stasis being the primary cause of gastric and duodenal ulcer, gall-bladder infection, hyperthyroidism; with all this you are familiar. I cannot, however, resist saying one word in condemnation of surgeons of this continent for accepting his work at its face value—in the absence of any attempt at scientific demonstration. As Dr. John Clark intimates in his review of twelve cases: Lane has proven that "it is possible for humans to live without the great intestine, and only in the occasional cases are they improved." The harm done by ileo-sigmoidostomy, in this country, as a result of Lane's visit would assume large proportions, could we but learn, first, the mortality, and, second, the suffering of the cases which recovered—not only from Lane's work—but also from that of enthusiasts who, later, followed his example. Even to-day they are returning for relief. Surely the time has arrived when we must cease this foolish chauvinism of foreign surgeons. Not that I would detract from the most cordial welcome to all scientists who visit our shores, but they should be treated as surgeons, and not as vaudeville entertainers. Such exhibitions as followed the visits of Lorenz and Lane should never recur.

Doubtless behind all this discussion of Mr. Lane, lie certain elements of truth. Some of these cases are improved. If we could prevent the enthusiast, who successfully removes an appendix, attempting the removal of the colon from neurotic individuals, who happen to have large cæcums, displaced viscera, or so-called "Lane kinks," even now some definite indication for this operation might have been formulated. We have developed on this continent, many whom I believe to be the very best surgeons in the world—but, unfortunately, we have also developed many of about the worst. The lack of ideals in certain quarters has led men to become surgery mad. The desire to operate is overpowering, and as a result the neurotic individual is a willing victim in their hands. The late Roswell Park was fond of an expression, "The resources of surgery are seldom successful

when practiced on the dying." To this might be added, the resources of surgery are seldom successful when practiced on the neurotic. The sooner we, as surgeons, realise that neurotic individuals who happen to have displaced viscera—with or without stasis—are patients for the internest only, the better it will be for our good name.

A very excellent review of this interesting group of cases appeared in the *Annals of Surgery,* June, 1918. The summary shows that variations in the peritoneal attachments are frequent; that they are found in children, before the possibility of any inflammatory process exists; and that they correspond in every way to the so-called Jackson membrane and Lane bands. When so many good surgeons are in doubt regarding these borderland cases, which at operation show Lane kinks, Jackson veils, bands, *et cætera,* I am in no position to venture more than a word from the clinical side. For the most part these individuals are cured by rest and forced feeding, but unless some evidence of obstruction is present, they are not cases for surgical intervention. Usually these cases occur in women, who have lost weight, have grown nervous, have pain in the right iliac region. X-ray shows enteroptosis, distended sigmoids, large movable tender cæcums. They are operated and reoperated, and the last condition is worse than the first. They are never cured until someone recognises that they are suffering from mental fatigue, and gives them enforced rest. Personally I have seen little, if any relief follow surgical effort in these cases.

Why do these cases have a large dilated cæcum? Even after a right colectomy the ileum will dilate, showing the cause of the original distention to be still present. The possible relation of the nodal area of Keith to the function of the ileo-cæcal valve is interesting and may be important, but I cannot see its particular clinical value. Kellogg and Case place the trouble in the valve, and report cures by repairing same. I am of the opinion that regurgitation through the valve is the result of obstruction lower down, but not the cause of the trouble. The frequency with which the cæcum dilates, would suggest a similar cause. In view of the fact that in these cases, (1) the cæcum dilates, (2) the ileo-cæcal valve is often incompetent, (3) the sigmoid is usually large and distended, the cause would seem to be lower down, probably in the lower end of the sigmoid, as this is the most fixed point of attachment.

There are certain individuals who have larger colons than their friends. This enlargement varies all the way from normal, to the well-known Hirschsprung's disease. I have seen these individuals go for weeks, distended and uncomfortable, relieved only by vigourous

washings. This type can unquestionably be relieved by surgery. I would like to offer for your sanction this rule. *That no case of stasis should be operated without definite evidence of obstruction.* If this be correct, then all cases with abnormal peritoneal attachments (not producing obstruction) are not suitable cases for surgery. The abnormal dilitations which occur are dependent upon definite obstruction lower down, either in the sigmoid or rectum, and a cure can only be obtained by relieving this obstruction.

In my personal pilgrimage around the country, I find a great diversity of opinion regarding the operations for these cases. Ileo-sigmoidostomy was much in vogue, but is rapidly disappearing. The almost certainty of regurgitation backward into the colon, is such a serious handicap, that most men have entirely abandoned it. I have several cases under observation now, that were opened by the late Roswell Park and myself—shortly following Lane's visit to Buffalo—where simply immense fæcal tumours appeared in the abdomen. to disappear under thorough bowel washes. These individuals sooner or later should submit to one of two procedures. Either the intervening colon should be removed, or the intestinal canal ought to be restored to its original relation. Lane himself, now admits that regurgitation is likely to follow his operation of ileo-sigmoidostomy, and he has given it up in favour of resection in most instances.

Regarding resections there is even a greater disagreement, whether the anastomosis should be a side to side, end to end, or end to side. We have been told in former years that it made no difference, because all forms of anastomoses after a few weeks gradually rounded off so as to form a perfectly straight tube. This of course is not so, as all have now seen cases where a diverticulum has formed on at least one blind end. It is rather difficult to show a diverticulum in a plate, but they can be demonstrated very easily by the fluoroscope. Formerly I followed the usual procedure of a side to side, closing both ends. Radiographic study of these cases showed a certain amount of dilitation of the blind ends in almost every case. Next, an end to side anastomosis was done. Here a diverticulum forms in the proximal blind end of the colon. The only method known to me of preventing this complication is to use the end to end anastomosis. Here one will have a dilitation of the ileum, as the back pressure is exerted directly on the ileum, instead of on a blind end. I think the reason for all this is quite plain. If one watches the bismuth under the fluoroscope, he can definitely establish the reverse current which takes place in the colon. Whether the material is sent back to the cæcum for the absorption of any remaining fluid I do not know; but that it goes back repeatedly is certain. The normal current, then, in the small bowel is always down-

ward, but in the large bowel it is in both directions. This no doubt explains not only the regurgitation which occurs in ileo-sigmoidostomy, but also the frequency with which a diverticulum forms in the blind end of any anastomosis. It is, doubtless, also the reason for the dilitation of the ileum which so frequently is seen in the end to end anastomosis.

Charles H. Mayo has added another feature to the end to side anastomosis, namely, suturing the proximal end of the colon to the abdominal wall, so it may be readily opened to relieve the great distentions which occasionally occur. These enormous distentions which occur are certainly important. Personally I have only seen this in one case; but it was exceedingly distressing. The patient had some fluid stools, but very little gas passed for two weeks. In the meantime the abdomen became enormously distended. I debated whether or not to reopen the incision to allow for the escape of gas, but it finally subsided normally. Later this patient died on the twenty-second day, from pulmonary embolism. These enormous distentions seem to occur so seldom, that I doubt the wisdom of deliberately planning an enterostomy in advance; but in the event of its occurrence, an enterostomy ought not to be long delayed.

The end to end anastomosis is really not difficult to perform. Leakage has been due I think to two main causes. First, the effort to make an anastomosis between two ends of different sized lumena. The remedy here is simply to divide one side of the ileum until the lumen is the same size as that of the colon. The so-called "puckering stitch," where the bite is longer distance on one side than on the other, will make up for a slight difference in the size of the lumen. For one or possibly both of these suggestions, we are indebted I believe to Dr. Charles Mayo. Second, the intestine must be divided along the line of the circulation, so that the side of the anastomosis opposite the mesentery will be viable. Theoretically there ought to be sufficient collateral circulation, but I have seen leakage at this point previous to my taking pains to prevent it. The circulation comes in a fan arrangement as seen in the mesentery. The bowel should be divided on a slant, so the side of the anastomosis opposite the circulation should be nearer the arterial supply. This in the large bowel, would mean dividing it so the curve would be from the mesenteric side towards the splenic side, and in the small bowel, the opposite direction—really making a V in the side opposite the mesentery. I have found by stripping back the omentum for a distance of an inch or more, the anastomosis is made more accurately. Of course it is necessary to accurately close the opening in the mesentery to prevent hernia. One cannot be too careful in the control of hæmorrhage in these cases.

Each vessel should be clamped and tied separately, and not in a large bulk of mesentery. The smoothness of convalescence in these cases is, in my opinion, directly to the amount of hæmorrhage. In fact it is astonishing how little reaction takes place when no blood has been lost. The wound is closed with an oil silk drain—this is for the protection of the external wound, as it is exceedingly difficult to prevent some superficial infection in these extensive resections.

My end results have been satisfactory in direct relationship to the amount of obstruction present at operation. Adhesions almost invariably tend to recur, but time usually cures them if the individual is fortunate enough to escape further surgery in the meantime. Where definite obstruction has been present the results have been excellent. I have seen no results in neurotics or joint infections—although, fortunately, I have had few of either class. The recent conclusions of Dr. Draper, in the *Annals of Surgery,* May, 1918, are in direct disagreement with my own. If the colon be excised in all our chronic joint lesions, I feel sure a great deal of harm will follow. It would seem that this operation ought not to be advised in these cases, with so little clinical evidence in its favour.

In reviewing my personal cases, I find there have been twenty-eight, excluding minor procedures, as cæco-plication, division of bands, *et cætera.* There were four shortcircuiting operations with two deaths from intestinal obstruction, leaving twenty-four resections. Of these eight were for carcinoma, divided as follows: cæcum, two; descending colon, five; sigmoid, one. There were two deaths—both in old people —with evidences of uræmia, being in coma and passing no urine. This leaves sixteen cases of marked stasis with partial obstruction. There were two deaths, one from hæmorrhage and the other (on the twenty-second day) from pulmonary embolus.

In the early cases done for stasis, where obstruction was not marked, relief was only partial; and I think the operation of doubtful expediency in this condition. However, where giant colons were present, where extensive post-operative adhesions produced obstruction (shown by dilitation) the relief was marked. The obstipation and associated pain disappear, and the results are in every way satisfactory.

Conclusion.

(1) Operation for stasis is indicated only in the presence of definite obstruction.

(2) When indicated, the operation of choice is resection.

(3) Resection should be done by end to end anastomosis to avoid formation of a diverticulum.

SOME OBSERVATIONS ON THE SURGERY OF THE BILIARY TRACT

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From the surgical standpoint, it may be conceded that the most important disease of the biliary tract is cholecystitis, associated or otherwise, with cholelithiasis. It would appear to have been sufficiently established that inflammation is the cause, not the result, of calculus formation, whether in the gall-bladder, cystic, hepatic or common duct. It is, however, evident that the symptomatology may be greatly altered when stone formation occurs.

Considering, then, cholecystitis, angio-cholitis and cholelithiasis as one great pathological entity, it would appear, from diagnostic standpoint, that there are two very distinct classes of cases, which may roughly be described as the *active*, or evident, and the *latent*, or passive. In the first group the symptomatology is so plain that "He who runs may read." Biliary colic, jaundice, chills and fever, and localised tenderness may occur in such combinations as to be pathognomonic. On the other hand, in the latent group, the symptoms may all be indefinite. Indigestion, gas after eating, pain under the shoulder blade, usually the right, indefinite local tenderness, at times only elicited by percussion, may comprise the symptom-complex. In this group the stomach complaints are usually predominant, and may suggest duodenal ulcer, for I have not found all cases of the latter condition present the typical Moynihan history. In the gall-bladder group, indigestion and gas formation are usually the complaints, rather than pain. Moreover, there is, frequently, a striking contrast between the general appearance of the patient with biliary disease, and the sufferer from duodenal ulcer. The woman, fair, fat and forty, rather inclined to physical and mental apathy, suggesting cholelithiasis, while the man of ten years younger, leading a strenuous mental life, usually of a nervous or worrying disposition, thin, sometimes anæmic, suggests ulcer.

In this connection I would beg to express my conviction of the utter uselessness of the Roentgen ray, as ordinarily used, in the diagnosis of gall-stones. It is quite true that, occasionally, positive shadows may be seen. It is also quite true, as pointed out by Cole, and George and Leonard, that at times the diagnosis may be made from negative shadows, but these two facts seem to me to offer the best evidence, if

both be true, that there must be an intermediate class of stones with an "X-ray" permeability, if I may use that expression, practically the same as the fluid contents of the gall-bladder, in which case no shadows, positive or negative, will be obtained. For this reason I feel that it is an error of judgment to submit evident gall-bladder cases to Roentgenological examination. It is regrettable, but nevertheless true, that the public has been mis-educated by a certain section of our profession as to the wonderful things that may be seen by means of the "X-ray." Consequently, if after an examination, no shadows are visible on the plate, notwithstanding that the other clinical signs may render the presence of stone almost certain, the patient is very likely to conclude that no stones are present, and, therefore, refuse operative advice.

I do not wish, in any way, to be understood as decrying, or underestimating, the value of Roentgenographic examination in abdominal lesions, pathological gall-bladders included, but I do desire to protest against the practice of leading a trusting public to believe that all that is necessary for a diagnosis of the cause of their stomachache is for them to be stood up in front of a "big machine," or have three or four plates taken. I do not for a moment admit that, in the hands of the average worker, "X-ray" findings, based on such observations, should be permitted to outweigh the evidence obtained from the history and clinical examination.

The work of Cole has demonstrated the value of forty or fifty serial plates in the diagnosis of duodenal ulcer, and George and Leonard in their most recent article on the Roentgen diagnosis of gall-bladder disease, in the *Medical Clinics of North America* (Vol. I., No. 4, p. 1007) say, "We cannot insist too strongly on the matter of making a sufficient number of plates, in the one position, and with the gastro-intestinal tract empty. In fact, we feel that the reason other workers have not had the success which we believe possible, is due to this very fact. This will explain, especially, we believe, the failure in hospital clinics as opposed to private work."

From the pathologic standpoint disease of the biliary tract presents many different classes of cases, which may merge gradually, one into the other:

(1) Acute suppurative or gangrenous cholecystitis, with or without stone,

(2) Chronic infected gall-bladders, filled with muco-pus, and usually stones,

(3) Contracted gall-bladders filled with putty-like material, or very fine sand,

(4) Gall-bladders containing thousands of very small calculi, oftimes associated with stones in the cystic, hepatic and common ducts.

(5) Gall-bladders containing a few fairly large calculi, also, often with stones in the ducts,

(6) Hydrops of the gall-bladder, with one or a few large stones impacted in the cystic duct.

(7) A group of rather more unusual conditions, including the strawberry gall-bladder, papilloma, and carcinoma.

It is quite possible that any one of these groups may, with the passage of time, come to belong to another group, and, of course, the change need not occur in the order given.

From our standpoint, the question of operative treatment is, next to diagnosis, of most interest.

In this connection, the incision to be used may be discussed. During recent years considerable has been written concerning the merits of the transverse incision, sectioning the rectus. It is claimed that this incision gives easier access, allows more room for work on a deeply-situated gall-bladder, is as easy to make, and much easier to close than the split-rectus incision, and adds only one more transverse scar or band to a rectus muscle which already has several such. My experience bears out all the good things that may be said in its favour, but also emphasises one very bad point, that is, the incision so made is certainly not as strong during healing as the vertical, or modified vertical. If nothing occurs to disturb convalescence, it is probable that the ultimate scar is perfectly well able to withstand any intra-abdominal pressure that may be brought to bear on it, but if the convalescence is stormy, vomiting troublesome, bronchitis or pneumonia intervene, or the patient be unruly and get out of bed, it is certain that this incision is more likely to break down. The rectus is a powerful muscle, and the whole force of its contraction tends to pull apart the suture line, and in one case under my observation, the whole incision was torn open with a resulting hernia of the transverse colon and several coils of small intestine out under the dressings. I have never seen any trouble of this kind with the split-rectus incision. When using the vertical incision, a procedure of considerable value is to make the incision through the posterior layer of the rectus sheath in an oblique direction parallel with its fibres. If necessary, additional vertical incisions may be made, but for the simpler operative procedures ample room will be obtained, and the incision thus made is very easy to close, after removal of the dorso-lumbar pad, or straightening out the table as the case may be.

Of recent years considerable discussion has occurred as to the

relative merits of cholecystectomy and cholecystotomy. Figures and statistics have been compiled, apparently indicating that cholecystectomy is the safer operation, but, while admitting that figures do not lie, I feel that deductions made from them may be fallacious, inasmuch as in any clinic where cholecystectomy is the operation of choice, this operation will be done in all cases where it can be managed with reasonable safety, while the drainage operation will only be used in the presence of complications, such as dense adhesions or a contracted, inaccessible gall-bladder—in other words, the difficult cases, that, possibly, would show the higher mortality from any type of operation. However, while not admitting that cholecystectomy is necessarily the safer operation, I certainly feel that it is the most satisfactory in the cases where it is indicated, empyæma of the gall-bladder, gangrene, hydrops, with stone impacted in the cystic duct, which cannot be dislodged, and the class of cases included in Group No. 7 above-mentioned. It must also be admitted that the drainage operation is definitely indicated in certain other cases, especially in the presence of angio-cholitis, stones in the hepatic, or common duct; here, of course, combined with choleduchotomy and removal of all stones; and, also, where there is an associated pancreatitis. Inasmuch as the diagnosis of cancer of the pancreas is usually only a probable one, and as chronic pancreatitis can duplicate all its symptoms and operative findings, it would appear to be good judgment to make a cholecystotomy for drainage in all cases of this type. It will do no harm to the real cancer case, and it may cure the inflammatory one. In acute pancreatitis, including the hæmorrhagic type, while drainage of the lesser peritoneal sac through the gastro-hepatic omentum is usually indicated, it should also be associated, if the patient's condition will permit, with drainage of the pancreatic duct system by cholecystotomy.

In making a cholecystotomy it is bad technic to suture the fundus of the gall-bladder to the parietal peritoneum. The tube should be inserted into the bladder with the fundus inverted round it by preferably two rows of inverting sutures, and the gall-bladder may then be allowed to drop back into its normal position, and the tube brought through the incision at the most convenient point.

POST-OPERATIVE MANAGEMENT OF ABDOMINAL CASES

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A pilgrim visiting the various shrines dedicated to surgery soon comes to the conclusion that operations are now pretty well standardised. Of course, certain clinics have the advantage of better diagnostic work; in others surgeons are undoubtedly more dextrous; nevertheless the aims and steps in the operations are about the same.

Contrast the difference in opinion as to how a patient should be treated after he leaves the operating table. Each clinic has its own ideas on this subject. Some surgeons follow their cases carefully through convalescence, others shift the responsibility to the house staff. Boldt insists that it is quite important to get patients out of bed a day or two after operation. Mumford thought seventeen days was none too long to keep a hernia case on his back. Some advise thorough cleansing of the bowels before operation, others oppose the idea. The list of remedies for tympanites is as long as that for vomiting of pregnancy. In the same hospital it is very common to find each chief has ideas quite different from his confrerés.

In some cases there is not enough attention paid to the post-operative management, in others there is perhaps, harmful interference. Davis and Owens have very recently advised the following routine treatment of abdominal cases: Immediately after operation one c.c. of pituitrin is given hypodermically and is repeated in two, four and eight hours. After severe abdominal operations one-half c.c. is administered every four hours for twenty-four hours. Twenty-four hours after operation they give half a grain of calomel every half hour for six hours and then a saline purgative. Four hours later they give an enema. These writers seem to believe that the most active treatment is necessary to insure convalescence. Others may feel that so much interference is not giving Nature a fair chance to assert herself.

The management of the operative case presents an extremely profitable field for study, wherein we may be able to reduce mortality, avoid unnecessary complications and to lessen discomfort. With these ambitions in mind, we must consider briefly certain steps to be taken before operation.

The history and physical examinations are all-important. We have lost cases or had stormy times because we could see only the

most evident disability. A woman was admitted for hernia, appendix, and Gilliam operations. The history was not carefully taken, as the fact that she had a slight cold was entirely overlooked. After operation she, as is usual in such cases, developed pneumonia and had a hard convalescence. Careful examination would have resulted in a postponement of operation. A woman was admitted with a large fibroid. Urine examination negative. She developed uræmia after operation. Blood pressure and kidney function tests had been neglected because she looked healthy. Quite recently a woman was admitted for hysterectomy, having a large fibroid. Urine report negative except that the specific gravity was 1003. A more careful investigation showed that she was passing several times the normal amount of urine and that her blood-pressure was 240, and that her kidney function was 50% below normal. Operation was declined as the patient certainly had interstitial nephritis. Such preliminary examination will surely reduce mortality. Many other examples might be given to show that the fate of the patient may rest on the care with which these examinations are made.

When a patient is found to have removable complications, any preliminary treatment which will eliminate them will certainly result in smoother convalescence. Surgeons should not ignore these various complications, no matter how trivial they may appear. After all only a few cases are real emergencies, and the raising of the kidney function, the neutralising of the positive Wassermann, the curing of slight colds, the building up of the nervous and the anæmic will amply pay for the delay in a more normal recovery.

Attention to the details of the actual operation also has a direct bearing on convalescence. The patient who is given the least anæsthetic and who is kept on the table the shortest time, other things being equal, will recover most promptly.

We find that to anæsthetise the patient in a separate room is not satisfactory. There is time lost in wheeling to the operating room and shifting to the table. A certain percentage during the shift cough, strangle, or develop annoying hiccoughs. We now prepare the operating room, cover all instruments with sheets and anæsthetise the patient on the table. No noise is permitted at this time. Only sufficient anæsthetic should be given to allow the surgeon to work. An occasional movement of the patient should not cause the operator to rave. Deep narcosis is not only unnecessary but, of course, is distinctly harmful. If the patient is kept barely under, he will certainly regain consciousness much more quickly and much of the distress of protracted vomiting and nausea will be avoided.

The surgeon who operates with gentleness requires only a light anæsthesia. The man who traumatises intestines necessarily must expect distension and gas pains. Careful hæmostasis is of great importance. Many of the complications of convalescence are due to carelessness in seeing that the site of operation is dry. Blood left in the abdomen will act as a foreign protein and cause a rise of temperature and often distension. Many cases of so-called shock are due to hæmorrhage. Even acidosis and uræmia have been called shock.

The avoidance of shock by maintaining a high temperature in the operating room, by gentle surgical procedures, and by administration of salt solution are understood. Its treatment by intra-spinal doses of adrenalin is now recommended by the Rockefeller Institute. Proctolycis is used in practically every institution, but I am sorry to state is not well executed generally. Visiting various hospitals, I have found that in very few were the nurses taught to give Murphy drip, so that there was much absorption of salt solution.

Post-operative pneumonia, perhaps, occurs more frequently than we have heretofore realised. There is no doubt that phthysis, slight colds, and grippy conditions are responsible in many cases. Occasionally a patient brings up enormous quantities of bile and mucous during operation. Such cases are peculiarly liable to pneumonia and should always be operated upon in Trendelenburg position. Pneumonia in the aged should always be anticipated by endeavouring to avoid passive congestion.

Nausea and vomiting occur but seldom where narcosis has been light. In all but peritonitis cases large drinks of water should be given as soon as the patient becomes conscious. Water given in sufficient quantity will be vomited, bringing up the ether soaked mucous. At one time we tried olive oil, but think that water acts much better. Lavage is rarely necessary.

Post-operative acidosis is becoming recognised as a not uncommon complication. It comes without warning and when least expected. During the last year I had two deaths from acidosis. Kidney function and urine analysis was normal in each case. Impure ether was suspected to be the cause and we promptly changed to another brand. At present we are not certain why it develops, and can only hope that satisfactory preliminary blood tests may be devised. The treatment of acidosis with alkalies has not been satisfactory in my hands. Cases recover without alkalies, others do not respond when injected.

Phlebitis following operations occurs much less frequently since closer attention has been paid to hæmostasis, and more care has been taken to eliminate dead spaces in suturing the abdominal wall. Every

operative case is massaged daily after bath, the idea being to avoid phlebitis by preventing stasis in the left leg.

Post-operative distension, gas pains, and paresis are almost entirely avoidable by careful preliminary preparation, skilful anæsthesia and gentle surgery. There is always, of course, some soreness and pain in the incision after consciousness returns, and if this distress is at all severe, it should be relieved by small doses of morphine, as rest is of greatest importance for the first few hours after operation.

In a paper covering such a large field it is manifestly impossible to go into details of the treatment of the various post-operative complications. Such complications should, however, be discussed as valuable information can be obtained from the ideas of the various clinics.

I have thought for a number of years that the ideal treatment of operative cases was to use the least possible amount of medicine and to try to follow natural methods. Our routine has developed slowly and after considerable experiment.

Careful examination, and, when necessary, preliminary treatment is completed. The night before operation the patient is given a light supper and the field is prepared. No cathartic is given, as there is a reaction after every cathartic. They tend to upset the patient, may cause some distension and wakefulness. The operation is discussed with the idea of assuring success and eliminating fear. Early in the morning water is given and the rectum emptied by a soapsuds enema. Operations, except emergencies, are always done in the morning, and thirty minutes previous a hypodermic of 1/6 grain of morphine and one 1/150 of atropine is injected. This is given simply to avoid an overabundance of mucous in the throat, and because it tends to quiet nervousness.

Before operation we are now removing the iodine from the skin with alcohol, believing it impossible to wall off the iodine-covered skin entirely with towels. After the patient is put to bed the usual hot blankets and hot water bags are applied and as much fresh air as possible is provided. We have in warm weather wheeled our patients on the porches and find they recover from the anæsthetic more rapidly than in a room. When consciousness returns large drinks of water are given until we feel sure that all mucous has been ejected from the stomach. The head of the bed is then raised two feet higher than the foot. Later during convalescence the head is raised only eighteen inches. In no case is the head allowed to remain level, as in this position there is better peristalsis, less stasis, and less indigestion. If there is much distress from the incision one-sixth of a grain of morphine is given the first night.

We have long since come to the conclusion that no food should be given until three days have passed. In fact, we give nothing but water during these days. Nourishment is not necessary, and if given will surely cause distension and distress. The stomach and intestines after abdominal operations are not in condition to do work. Rest is needed so that they may recover their tone. Usually the second, or at latest, the third day, gas is passed, indicating that normal peristalsis is rapidly returning. On the evening of the third day a small dose of cascara is given, followed by an enema on the morning of the fourth day. Soft diet is then given. During this period we are never obliged to use any treatment for distension or gas pains. We believe that any medicinal means for stimulating peristalsis is not only unwise but invariably harmful. Eserine or pituitrin are never needed if food is withheld, and the head of the bed raised. In many hospitals a cathartic is given twenty-four hours after operation. It seems uncalled for as I have never seen a temperature after operation relieved by moving the bowels. Early rise of temperature is due either to surgical infection or absorption of blood serum. During the time our patients are in bed they are required to chew gum, because it keeps the tongue clean and moist, it increases saliva, reflexly increases gastric juices, and most naturally starts normal peristalsis.

I do not wish to leave the impression with you that we never have complications, that I am sorry to state would be far from the truth. We are sure, however, that our patients have far less discomfort when cathartics and food are withheld. We feel that the chewing gum and the raising the bed aids Nature in reëstablishing peristalsis, and we also feel that once peristalsis has become normal our worries are over.

Before closing it might be well to briefly discuss the proper time for allowing a patient to leave his bed. A few clever surgeons urge that patients be made to sit up in a chair one or two days after operation. Their reasons have not been very convincing, and there seems to be no danger of general conversion to their ideas. There is no doubt, however, that the average period for keeping abdominal cases in bed has been greatly shortened in recent years. It would appear that this is not a question that can be fixed by rule, but should depend on the length of the abdominal wound and on the condition of the patient.

While one week is long enough to keep a simple appendix case on his back, those requiring larger openings should be made to stay in bed until there is strong fascial union. This does not take place under two weeks and before that time there is more or less danger that the cut edges of the fascia will stretch apart.

SECTION VIII

TUBERCULOSIS

PRESIDENT'S ADDRESS, EIGHTEENTH ANNUAL MEETING CANADIAN ASSOCIATION FOR PREVENTION OF TUBERCULOSIS

J. A. Machado, Ottawa

It is a matter for sincere congratulation that the eighteenth annual meeting of our association should be held in this beautiful City of Hamilton. For not only is Hamilton noted for its generous hospitality, but it is also noted for the public-spirited coöperation of its citizens in a well-organised and efficiently carried out programme of constructive work for the fight against tuberculosis. By the study of the work being done by our friends in Hamilton, we can learn much that will be helpful and inspiring to us all, and we can return to our various homes more than ever encouraged to carry on and to enlarge the work that we have been doing.

Our country is still at war, and no one can tell how long it may still go on before a victorious peace shall be won. One thing is sure, and that is that Canada and the Allies will see it through. We long for peace but until we have won the victory we should not think of peace, nor talk of peace, but bend our whole energies to the prosecution of the war until truth, and right, and justice, shall have been acknowledged by our enemies as the true and only basis of right relationships between all the nations of the earth.

The war has brought upon our Empire great sacrifices of life and treasure, and great suffering to millions of innocent people. When we think of these things we are overwhelmed with the hideous picture it presents, and the injustice of those who are responsible for bringing it upon the world. At the same time the war may be productive of the greatest good if we read its lessons aright, and take advantage of its experiences, in order to make a great advance in all those matters which affect the general welfare. At no time in the history of our

country have men's minds and souls been so aroused to what citizenship means, and as a result we can to-day initiate plans, as war measures, which would not be possible in normal times of peace, when we are all too prone to interest ourselves in our ordinary occupations, and to forget our real duties as citizens. The war has brought us face to face with our responsibilities; and as our bravest and best have gone to fight for us overseas it is incumbent upon us here at home to see that we are not found wanting. It is our solemn duty and our splendid opportunity to so plan and work that our sons when they return will find that we have been helping to lay the foundation for a better and a greater Canada. We ought, at this time, to take counsel together and prepare wise plans and select careful builders for the new home that is our ideal. Above all, we must select the best possible foundation, and that foundation is surely Good Health, for nothing else so vitally affects the everyday life of all our people.

Our association occupies an unique position to be of service in this great work of reconstruction. For our special problem touches most of the vital problems of everyday life—housing, food, education.

We cannot deal with our special problem without considering these all-important questions, and it would appear that the time has come when ye should make very special efforts to coördinate all the agencies, federal, provincial and civic, that are engaged in these problems, in order to prepare and initiate a nation-wide programme in which all can take an active part.

Personally, I believe that the most fundamental need is the proper and thorough education of the children of Canada in all that pertains to the health of the community and the individual. This war has clearly proved the truth of the old saying that the "children of to-day are the men of to-morrow." Our German enemies have turned this truth to the building of a nation of warriors. For example, for many years past the school-children of Germany have been obliged to carry their books in knapsacks, and this was explained to an American friend in words somewhat as follows: "We are training our children to be soldiers, so all German children carry their books in knapsacks. As they progress, the books used increase in numbers and weight, so that when they leave the high schools the weight carried is about equivalent to the pack a soldier carries." In the same German city, kindling wood was delivered in large carts drawn by fifteen to twenty school-boys, who were harnessed to the cart and so were trained to work and pull together. These are small things, and perhaps seem trivial, but by such methods Germany has built up a machine of immense power. Germany has used education for the destruction of

mankind. Let us use it just as efficiently for the training of our children to those higher and better purposes which are reflected in service to our fellowmen.

As a layman, I speak with diffidence in addressing a body of professional men, and so will not enter into further details of the technical plans that would be necessary in a nation-wide movement, but as a layman and employer of labour, I cannot too urgently emphasise the importance of educating the school-children in all health matters; of giving them careful medical examinations coördinated with physical training, and exercise, and diet, in order to build up a better and a stronger race of Canadians, who will enable Canada to maintain a high place among the enlightened nations of the world.

In closing, I would like to pay a tribute to the work of our Canadian association. I recently wrote to the secretaries of our various provinces for a detailed statement of the work being done by each province in the fight against tuberculosis, and it is most gratifying to see how generally they have made, and are making, use of our educational pamphlets and posters.

Our association has done good work, but in view of present conditions and opportunities, the time has come to adopt a larger and broader programme. We should take the lead in endeavouring to bring about as soon as possible a closer coördination of all the agencies that are working for the elimination of tuberculosis. The splendid work that is being done by the Military Hospitals Commission has opened the eyes of the Canadian public to the vital need and great importance of this work, and, therefore, makes it possible that we should take a great forward step at this time.

May I express the hope, and recommend for your consideration, that before our meeting adjourns we may appoint a special coördinating committee, which shall consider and report to your executive as promptly as possible how best to secure the united efforts of all our public health and welfare agencies, so that the highest efficiency and best results may be obtained.

THE EIGHTEENTH ANNUAL REPORT OF THE EXECUTIVE COUNCIL OF THE CANADIAN ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS

GEORGE D. PORTER, M.B., SECRETARY, TORONTO

While it becomes increasingly difficult to record anything of special interest in our annual report, yet it is with pleasure that we are able to report continued progress in our work throughout Canada during the year. The most striking evidence of this progress is naturally shown in the increased accommodation for the tuberculous in sanatoria and special hospitals. This is largely due, however, to the added claims of the tuberculous soldiers. But important as these institutions are, they do not cover the entire field of work being done by those interested in the anti-tuberculosis movement. Institutions can be seen, but educational work and the formation of public opinion along health lines, which form, according to Dr. Hastings, "ninety per cent. of the permanent efficient work in public health administration," goes on steadily, but often unseen.

As it is just nine years since our association last met in the City of Hamilton, it is most natural to review the work as then presented, and compare it with the present, and it will be seen that since then great strides have been made in the anti-tuberculosis movement throughout Canada.

At that time there were only six institutions in Canada. Now, apart from those opened by the Invalided Soldiers' Commission, there are forty. At that time there was only one institution west of Hamilton. This was in British Columbia, and as the report then stated, its "sixteen beds taxed their accommodation to the utmost." Now there are ten west of Hamilton, and a proportionate growth in numbers east of this city.

The accommodation at that time throughout Canada for the tuberculous was about three hundred and fifty beds, now it is about three thousand. The money then spent in maintenance account in these institutions was less than one hundred and fifty thousand dollars per annum. This years' reports (apart from those of the Invalided Soldiers' Commission) show more than nine hundred thousand dollars in the total maintenance expenditures of the various local sanatoria. Some three million dollars have been spent in plants in Canada, which is considerably less than the amount spent for ordin-

ary hospitals with the same accommodation. These figures show a wonderful growth during the past decade.

While the National Sanatorium Association was the pioneer organisation in Canada, and by far the largest, and the one in Nova Scotia was the first provincial institution, the sanatorium at Hamilton was the first local, or county, institution in Canada, and is not only a fine example of voluntary organisation and civic spirit, but has proved an inspiration to other counties and cities, as evidenced by the springing up elsewhere of like institutions, such as those at London, Brantford, Essex County, and other centres.

In all these centres while the provincial government greatly assists by its grants, and the municipalities and counties add their share, yet their beginning and growth are invariably due to the leadership of some public-spirited citizens. Here in Hamilton you have been most fortunate in that respect, and among these none could have a larger place than Mrs. P. D. Crerar.

The growth of the work in this city will best be seen by those delegates fortunate enough to accept the kind invitation of the Hamilton Health Association to visit the Mountain Sanatorium this afternoon.

In all this work education plays a leading part, and for arousing and stimulating public interest in this great movement throughout Canada, our association, we feel, has been directly and indirectly responsible for a large share.

It will be needless to go fully into the details here of this growth, which has been more or less general throughout the Dominion. In spite of the war we have been enabled, by our federal grant, to provide free literature, which has been widely distributed. This includes 10,000 annual reports, over 15,000 pamphlets, and hundreds of thousands of leaflets. Our new posters have proved most useful, and have met with an excellent demand. There are sets of them in nearly every Canadian sanatorium, every dispensary, in numerous travelling exhibits, in some schools and colleges, and in a few factories. Last month we had a request from the Rotary Club of Vancouver for a large number of them for the purpose of stimulating public interest in their campaign for raising $75,000 for a tuberculosis clinic in that city, and in expressing their appreciation they spoke of them as being "graphic and immeasurably valuable posters," while the Invalided Soldiers' Commission recommended them strongly as being most suitable for educational purposes. We have, also, some over in France with the American commission there, and some in the United States.

The Ontario educational department has printed an authorised edition, for use in public school libraries, of our pamphlet on tuberculosis, the material for which we are indebted to the American association. This pamphlet has had a wide circulation, and should prove of great value to the public.

Through the courtesy of our president, Mr. Machado, we have received the assistance of Dr. Wilfrid Grenfell in the distribution of some of our literature in Labrador and Newfoundland. This makes a beginning of our work in those fields.

While we do not intend detailing the various local activities here, yet we cannot omit calling attention to the opening of the large new pavilion for tuberculous soldiers at London this year. This is one of our finest buildings, and is a credit to the London Health Association and to their leader, our former president, Sir Adam Beck. The new hospital for Quebec City is now completed, and will accommodate one hundred patients.

The Saskatchewan league also has erected a sanatorium at Qu'-Appelle, which will be greatly enlarged by federal and provincial assistance, for the care of tuberculous soldiers. The work in this province was started by the commissioner of public health, Dr. M. M. Seymour, with the assistance of our association, some eight years ago, and while somewhat delayed, that work is now bearing fruit.

As pointed out by Dr. Parfitt in the Invalided Soldiers' Commission report, and by Dr. Elliott in our own report of last year, "Tuberculosis bears practically the same ratio to other forms of disease in the army as it does in civil life." In the last bulletin of Invalided Soldiers' Commission, we find that there were in April, 1918, 965 overseas patients in sanatoria, 237 camp patients, with 64 on furlough, making a present total being attached to sanatoria, 1,266.

It is our intention to obtain from the army, if possible, records of those rejected on account of tuberculosis, and follow up these cases in an educational way, as is now being done in the United States.

From accounts, more or less official, received from European countries, tuberculosis is very rife over there, due, no doubt, to lessened resistance from lack of food, and war conditions generally, such as over-crowding and contact with open cases; and the death rate from this disease has incresed somewhat in Great Britain since the war. In this connection may we urge the value, as a health measure of the first importance, of the present efforts at greater food production. Even were there no question of the fear of starvation, none can dispute the great importance, from a national standpoint, of retaining the vitality of our people, and for this the increase of

food production stands easily first. And if true here in Canada, how much more necessary for those suffering abroad.

We have just received from Dr. Bryce some posters used by the American Commission on Tuberculosis now working in France. You will notice on one of these striking French posters this sentence, "The German eagle must be conquered; tuberculosis should be, also." While doing all in our power to achieve the former, we must not forget that the health of our people is of supreme importance in these same efforts, for anything that lessens tuberculosis adds more men to our fighting line, as tuberculosis hits hardest in the prime of life. The last Ontario provincial board of health report shows very clearly that the ravages of this disease are most evident in those between the ages of twenty and twenty-nine—in other words, the military age.

The January number of *The British Tuberculosis Journal* contains a symposium on Tuberculosis and the War and we cannot do better than quote from some of these timely articles, for what they suggest regarding conditions and their betterment in the Old Land holds true for Canada as well. As pointed out by Sir William Thompson, "The treatment of tuberculosis in sanatoria (in Great Britain) since the outbreak of the war has, and is, becoming increasingly difficult"; and the tuberculosis worker, according to Dr. John Guy, "should strongly support every movement likely to make for the physical betterment of the race, such as child welfare schemes, fuller provision for open air schools, more physical culture in the schools, teaching of mothercraft and household management, house visitation by nurses and improved housing conditions."

Sir Garrod Thomas continues, "As far as in our power, facilities should be given to enable such tuberculous patients as are physically fit to be trained and to be engaged in healthy occupations. Though there are many desirable occupations available, even that is not enough; the conditions of working must be hygienically and economically right. It is easy enough to train patients in sanitary habits and hygienic customs when they work together in colonies, or are congregated in institutions set apart for tuberculous subjects, but the real difficulty and the practical leakage come when these tuberculous cases return to their own homes and fall back into their old surroundings, and that is where the best and most promising work is to be done; and yet it is the centre of effort that presents the greatest difficulty. There will always be breeding-places for tuberculous cases until people know the value of fresh air and general healthy conditions, and seriously act upon such knowledge; the aim should be to make

every home a sanatorium, and until that ideal is reached there will always be fertile nurseries for fresh cases in country and town homes alike."

The question of establishing some system of after care for ex-soldiers discharged from sanatoria after treatment is one of the problems now occupying the attention of the Invalided Soldiers' Commission.

We can conclude with nothing better than the words of Dr. Thomas Nuttall, for with his sentiments we are sure, all tuberculosis workers must agree, "Whoever—whether Minister of Health or other official—" he says, "will supply our industrial and poorer classes with more airy and commodious dwellings, and will, further, insist on the institution and maintenance of hygenic conditions in the homes and workshops of our land, will have the honour of achieving one of the most important reforms ever brought about by man."

TUBERCULIN IN THERAPEUTICS, WITH SPECIAL REFERENCE TO NON-PULMONARY CONDITIONS

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It is not the intention of the author of this paper to enter upon a theoretical discussion regarding the action of tuberculin. This ground has been ably and thoroughly covered in former papers that have been given before the Canadian Medical Associations, notably by Dr. R. H. Patterson, in his paper which was read at the meeting of the Canadian Medical Association held in Montreal last year.

We merely intend to set forth in as brief a space as possible the results which we have obtained, with the use of tuberculin, at the tuberculosis clinic at St. Michael's Hospital, together with a short description of the technic employed.

In a subject of this kind a certain amount of detail cannot be avoided and we trust we will not bore you in our efforts to make the subject a practical one, and to endeavour to dispel the veil of mystery that shrouds the whole question of the use of tuberculin.

The Syringe

The hypodermic syringe used is a one c.c. record syringe graduated in tenths. Each subdivision, representing one-tenth of one c.c., is again subdivided into five smaller subdivisions, each of these representing one-fiftieth c.c. or .02 c.c. The plunger should fit tightly in the barrel, for if it is at all loose one cannot measure small quantities exactly. As the plunger has a tendency to become loose after continuous use, the syringe must be renewed every few months. A platinum needle is preferable, but not essential. In any event, the needles should be as fine as possible. We keep them in a flat covered glass petri dish filled with alcohol. This prevents them becoming plugged with rust, and also gives satisfactory sterilisation.

Dilutions

The early failures in the use of tuberculin are now generally conceeded to have been largely due to the fact that the dosage was much too great. These large doses produced reactions, which we now understand to be danger signals, and any suggestion of their appearance is sufficient to reduce the dose.

We therefore commence with a very small dose, which is slowly increased until signs of reaction warn us that the limit of tolerance is reached. These small doses are obtained by using dilutions of standard tuberculin. Formerly at our clinic we used dilutions of one is one hundred thousand of the B.E. (Bacillen emulsion) tuberculin. The method of obtaining this dilution is as follows: Five glass bottles are obtained, and sterilised by boiling. In each bottle is placed one c.c. or any greater quantity of the diluent. The diluent being a solution of .4% phenol—two drops to the ounce of water will give this percentage. The carbolic serves to keep the solution sterile. One-tenth of the content of the first bottle is removed and replaced by tuberculin (B.E.), giving a dilution of .1. Then one-tenth of the content of the second bottle is removed and replaced by the same quantity from the first bottle, giving a dilution of .01 c.c. This is repeated, until finally the last bottle contains tuberculin in a dilution .00001. In carrying out this simple technic the one c.c. tuberculin syringe is used as a measuring pipette, as it is graded in tenths of a cubic centimeter. The weaker dilutions are made fresh every month, and are kept in the ice chest.

Some time ago we commenced using dilutions of O.T. in place of the B.E. and our results from the O.T. appear to have been rather better than those obtained with B.E., so that we have come to rely upon O.T. entirely, both for the purpose of the tuberculin test and for therapeutic use as well. Tuberculin for use in the intra cutaneous skin test is put up in a special bottle, in a dilution of one to four hundred of O.T., the diluent employed being .4% phenol. The therapeutic tuberculin in a dilution of one in one hundred thousand can be obtained from the test tuberculin by adding .08 c.c. of this one in four hundred dilution to twenty c.c.'s of .04 phenol.

Dosage

The question of dosage is still an open one. Some observers consider best results are obtained by starting with a small dose .02 c.c. (1/5000 m.g.), and gradually increase the dose until it has reached .2 (1/500 m.g.), when it is kept at this amount and not increased beyond this. The alternative method is to start with the same small dose .02 c.c. (1/5000 m.g.), and to progressively increase the dose to the point of tolerance. We have had better results with the larger doses. Of ten cases treated with comparatively small doses, that is the maximum dose not exceeding .2 (1/500 m.g.), five were cured, three improved and two unimproved. Of eleven cases treated with comparatively large doses up to one c.c. (1/100 m.g.), seven were cured and four improved, which is a better result. In making this com-

parison, only cases that were at least three months under treatment are included.

We use, as before stated, for therapeutic administration a tuberculin of a strength 1/100,000 (1/100 m.g. to 1 c.c.). This is given twice a week. The initial dose is .02 c.c. of the dilution, this is raised next dose to .04, then .06, and so on, increasing steadily, unless stopped by a reaction. In none of our cases did we find it necessary to increase the dose beyond one c.c. (1/100 m.g.).

Reaction

In connection with the question of reaction it is interesting to recall the first case treated with tuberculin in Toronto. This was in January, 1892. In those days the reaction was looked upon as a favourable sign, and the object seems to have been to induce a vigourous reaction. The patient was a chronic case of lupus, who had been around the old General Hospital working in the dispensary for fifteen years. At this time he was a patient of Dr. Charles Sheard Sr. He was given a generous dose of Koch's lymph (it was not then known as tuberculin), injected into the gluteal region. A violent focal reaction was set up, the patch of lupus on the man's face became reddened and œdematous, at the same time a general reaction developed, the patient began running a fever. Signs of pulmonary Tb. appeared, and death occurred within a few months from rapidly spreading pulmonary tubercle.

This case well illustrates the dangers of causing a reaction, and the necessity of becoming familiar with the various reactions, that they may be recognised.

A reaction may be local, and occur simply as a redness at the seat of injection. This form is rare and occurred in only one of our cases, in which, after the arm had been red and swollen for a time, a tuberculous ulcer formed at the seat of injection of the tuberculin. This subsequently healed under proper dosage. A focal reaction occurs as a lighting up, and increased activity of the lesion. A general reaction is the commonest of the three, and varies from a feeling of ill-being, with loss of appetite and headache, to a condition of prostration, with chill and fever. The appearance of a reaction suggests that an overdose of tuberculin is being given, this should be discontinued entirely for a week or two, and then gradually recommenced in much reduced doses. In the vast majority of cases treated by gradually increasing doses, no reaction occurs. One is most likely to take place when the dose is in the neighbourhood of .15 to .3 of the dilution. Even a slight reaction is apt to delay healing and should be avoided, if possible, by increasing the dose gradually.

Selection of Cases

Tuberculin cannot be used successfully in every case of tuberculosis. Contra indications for its use are the presence of fever, or grave constitutional symptoms, such as a rapid pulse, marked loss of weight and poor appetite. Our experience has been that it must be used with great caution in cases of pulmonary tuberculosis. A reaction is easily inducted, even with the smallest doses. Why this should be is clear if one considers the nature of the lesion in pulmonary tuberculosis. The focus is situated in a highly vascular organ, where considerable absorption must be constantly going on. The problem is to limit the amount of tuberculin, by putting the patient to bed and restricting his exercises, and to prevent, if possible, any rise of temperature, which indicates a reaction. In two cases of pulmonary tuberculosis one began running a fever after the first dose of 1/10,000 m.g. (.01), the second acse received three doses up .04 (1/500 m.g.); a severe general and focal reaction, with hæmoptysis, was set up. The tuberculin was discontinued in both cases, and appeared to have done definite harm.

Most satisfactory results have been obtained in cases of surgical tuberculosis. Cases of tuberculous ulcers, tuberculides of the skin, tuberculous sinuses, associated with gland, bone and joint tuberculosis. Sinuses persisting after spontaneous rupture of cold abscesses, or persisting after operation, on tuberculous foci. These chronic tuberculous sinuses can be made to heal under tuberculin, after months or years of unsuccessful effort along surgical lines.

Footnote.—A paper on "Tuberculin in Pulmonary Tuberculosis" was presented by one of us (J.H.E.) at the meeting of the Canadian Association, June 3rd, 1910. The conclusions advanced at that time from a study of series of cases may be here added to supplement our conclusions in the treatment of non-pulmonary tuberculosis.

1. Tuberculin must be considered as a valuable aid in the treatment of selected cases of pulmonary tuberculosis.
2. Properly used tuberculin is harmless.
3. The physician using it must be well acquainted with the techinc of its employment, and be capable of judging the signs of reaction.
4. Tuberculin can be used in advanced as well as in early cases of pulmonary tuberculosis, if free from fever.
5. In many cases where recovery be hoped for, there is a lessening of some of the troublesome symptoms.
6. It can be given in private office practice (hence in dispensary work), as well as in sanatoria.
7. Patients may continue at work while under treatment without detriment.
8. It cannot replace careful hygiene dietetic treatment, but is to be looked upon as a adjunct to this treatment.
9. It seems especially indicated in those tuberculous patients whose disease has undergone partial arrest, who are free from fever, and who have ceased to make further gain under careful hygient dietetic treatment.

Results

In considering our results one must remember how chronic any tuberculous process is, and, to be successful, any form of treatment must be prolonged. Little result could be obtained in cases under observation for less than six weeks, and to effect a cure, require from three months to a year. The average length of time being five months. Our series comprises thirty-three cases, fifteen cured, twelve improved, and six unimproved. One, a case of post operative tuberculous peritonitis, associated with pulmonary tuberculosis, the lesion in the lung became active during treatment, and the tuberculin discontinued on this account. Three were cases of phlyctenular keratitis, under treatment for less than a month.

Of the cases listed as improved, some are still under treatment, and the balance, for the most part, under treatment for less than six weeks. Our results in detail were as follows:

Post Operative T.B.

Discharging sinus following removal of T.B. pyesalpinx, under treatment five months, cured.

Discharging sinus, following laparotomy for T.B. peritonitis, treated surgically for eight months before receiving any tuberculin, under treatment with tuberculin seven months, cured.

T.B. ulcer, following operation for T.B. testicle and cord, under treatment one week, slight improvement.

T.B. ulcer, following removal of testicle and portion of scrotum, treated surgically for three months before receiving any tuberculin, under treatment three months, cured.

T.B. ulcer, in scar following laparotomy for tuberculous peritonitis, under treatment three weeks, slight improvement.

Tuberculous ulcer in scar, following laparotomy for peritoneal tbc. fibroid rt. ap., focal reaction in lung, hæmoptysis, no improvement.

Sinus, following removal of tbc. kidney, was treated nine months before tuberculin was used, under treatment two years and three months, marked improvement, still under treatment.

Sinus, following removal of tbc. testicle, under treatment seven months, cured.

Sinus, following laparotomy for tbc. peritonitis, under treatment nine months, marked improvement, a small superficial ulcer remained unhealed when patient stopped coming to clinic.

Seven cases of phlyctenular keratitis, one cured, three improved, three unimproved. In the three unimproved cases, the children only came to the clinic for two or three weeks, and then discontinued com-

ing. In the three improved cases, there still remained a small speck of opacity on the cornea, which could be detected in a good light, *i.e.* all activity ceased and the lesion healed with slight scarring. These cases of phlyctenular keratitis clear up well under tuberculin and are usually referred to us by the eye clinic, after other methods have failed.

Eight cases of T.B. cervical and axillary adenitis, associated in each case with a discharging sinus.

Four cases treated from four to seven months, result, cured.

Four cases treated from five weeks to two months, improved.

One case genito-urinary tbc. under treatment. One month, slight improvement.

Tuberculous ulcer of skin, under treatment three months, cured.

Tuberculous ulcer on chest, under treatment five months, cured.

Numerous and extensive tuberculous sinuses of buttocks, subsequent to bursitis beneath gluteal muscle, under treatment two years, cured.

Tuberculous left hip, with discharging sinus, under treatment four months, sinus healed.

Tuberculous osteo myelitis of left forearm bone, under treatment eight and a half months, cured.

Psoas abscess, following Potts' disease of lumbar spine, nine months under treatment, improvement, still under treatment.

Tuberculous abscess and sinus of breast, under treatment seven months. Improvement, still under treatment, practically cured.

Tuberculides of skin and T.B. axillary adenitis, under treament four months, cured.

Conclusions

In cases of chronic tuberculous ulcer, tuberculides, tuberculous sinuses, associated with bone, joint or glandular disease, or persisting after operation upon tuberculous foci (peritonitis, salpingitis, epididymitis, mastitis), tuberculin gives satisfactory results.

It may be administered in dispensary and clinic work while the patient continues at work. Many of our cases came for treatment at the noon hour from factories and workshops.

Small doses apparently give most satisfactory results. We rarely used other than a 1 in 100,000 dilution of B.E., or O.T., and the dose varied from .02 c.c. of this dilution to 1 c.c. It is a valuable adjunct to surgical measures.

THE SANATORIUM TREATMENT OF TUBERCULOSIS, ITS METHODS AND RESULTS

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Possibly Dr. George Bodington, who, in England, in 1840, was the first to advocate sanatorium treatment for consumptives, may have been influenced by the teachings of the renowned Hippocrates, when he wrote his essay on the "Cure of Pulmonary Consumption, on Principles Natural, Rational and Successful." Bodington established a small place in Warwickshire, and recommended for tuberculous patients a generous diet of nutritious and digestible food, fresh air day and night, regulation of exercise and the constant supervision of a medical superintendent. His teachings did not fall in with the views of medical men at that time, and his method of looking after patients had to be finally abandoned.

To Dr. Brehmer, Silesia, is due the credit for working out the principles on which our present method of sanatorium treatment of tuberculosis is based. Brehmer showed that it is not so much where the consumptive lives as it is how he lives that is of most importance; that a patient cannot be left to his own devices; and nowhere can he be so carefully looked after as in a sanatorium, where he may live in the open day and night, have abundance of good food, and his life carefully controlled and directed under the constant supervision of his physician.

The rest and open air method of treating pulmonary tuberculosis, as originated by Brehmer and his pupil Detweiler, who added rest, as a valuable principle of treatment, has been followed, with but few changes, since 1859 by the majority of sanatorium workers in America and Europe. Even Trudeau, the great pioneer of outdoor treatment on this continent, who, in 1884, established the Adirondack Cottage Sanatorium, Saranac Lake, was satisfied up to a short time before his death that his patients should lead a life of ease in the open. While he was always a firm believer in the value of rest, he never carried it to an extreme, but permitted in addition short walks and light craft trades to those who were going on to recovery. These exercise measures, however, were never applied scientifically, and with the thought that possibly if they were graded and accurately adjusted to the requirements of the individual, they might in some way increase

the production of protective substances in the blood and raise the patient's immunity to his own bacterial products.

This seems to have been the idea of Dr. Marcus Paterson, who, in 1911, published a book called "Auto-Inoculation in Pulmonary Tuberculosis" in which he detailed most carefully his method of treating patients at Brompton Hospital, Frimley, England. His was the first attempt, based on sound physiological principles, to explain the successful results that may be obtained by graduated rest and labour. His method of treatment was briefly as follows:

1. For patients with fever or other constitutional symptoms absolute rest in bed.

2. For afebrile patients, without constitutional symptoms, graduated exercise.

His belief was that if his system of rest and exercise were properly applied, it would control the discharges or auto-inoculations of the patient's own bacterial products into the blood and lymph stream, and would gradually train his body to deal with these toxins until a state of immunity was attained.

The superintendent of Brompton Hospital waxed enthusiastic over his method, but although it has been tried and is used by some institutions, it has not been adopted at all generally by the profession. We must say, in justice to Dr. Paterson, that his system has not been tried out in the scientific, graded way originally outlined by him. This has been due to two factors, first, equally good and even better results may be obtained by less labourious methods; and, second, the medical staff of most institutions in Canada and the United States is such that it cannot devote the time that is required to follow it intelligently and carefully. Frankly, I am not in favour of the general application of Paterson's system of graduated work for consumptive patients. I believe that, if it is to be applied at all, it must be given to those whose disease is not too extensive, chiefly good first and second-stage cases of tuberculosis, and those in which the general condition is such that one may, with safety, apply this therapeutic measure. For such patients as have more extensive disease, I have yet to be convinced that severe employment, even when it is properly controlled and regulated, promotes healing around the tubercles and brings about ultimate arrest of the disease. The theory of auto-inoculation, as worked out by Paterson, is certainly plausible, but just as in the use of tuberculin, one never knows exactly what it may do when the patient is overdosed with his own bacterial products. While it is always possible to excite auto-inoculations, it is not always possible to control them, once the tubercle walls have become damaged.

Neither do I approve of treatment which carries out in a haphazard way its rest treatment, where no manual work is allowed and the life of the patient is made too idle a one, where long hours of rest are prescribed in the open, and only short walks are given to relieve the monotony of cure-taking.

No one who has had any experience in the treatment of tuberculosis will deny that rest is indicated in recent and advancing lesions, but there surely comes a time in every case progressing towards recovery when exercise is called for, even when absolute rest has been necessary in the beginning of treatment. Of course, no responsible physician would fail to grade carefully the exercise permitted his patient, beginning with very little and increasing slowly. For, after all, the exercise of the recovering consumptive must always be graduated exercise.

In the sanatoria and health resorts where the rest cure is carried to excess we find that many consumptives exhibit a deceptive appearance of ruddy health, while they become mentally dull and listless; they fear muscular exercise of any kind, and imagine that the least work aggravates their trouble; and, even if their disease be arrested, at the end of treatment we find that, after they return to the normal activities of life, a large proportion of them break down and are even in a worse condition than before.

The treatment of tuberculosis does not then begin and end with fresh air and exercise, neither does it begin and end with fresh air and rest. The three of these measures, however, when properly combined and balanced are safe and sound, provided that they are skilfully adapted to the requirements and capabilities of the individual patient.

The sanatorium treatment commonly adopted to-day, and which we follow at the Nova Scotia Sanatorium, is as follows: On admission of a patient the usual medical and laboratory examinations are made, and all data relating to the patient and his disease is entered in the sanatorium records. While he is under observation, no exercise is permitted. This is strictly adhered to, particularly if there be any signs of active disease. In case the temperature is found to be constantly above 99° Farh., the patient is placed in bed and kept there until it is considered safe to allow him up. It is the intention of the management in the near future to institute longer initial periods of rest, even if the patient be apparently free from active signs of disease on admission, provided there is a history of activity shortly before coming to the sanatorium. X-ray examinations undoubtedly show that marked improvement in the lungs will follow when patients,

who have had recent pulmonary trouble, are placed down in the beginning of treatment to a period of complete rest. The needs of each individual patient are studied, and when such rest as I have just spoken of is no longer required, walking exercises are prescribed, and, as I have indicated, carefully graded. The distance varies from a short five minute walk up to four or five miles a day according to the patient's ability to stand it. Provided the patient continues to improve, vocational work of various grades and kinds is now indicated. The employments include embroidery, basketry, rug weaving, wood work, gardening (vegetable and flower growing), and automobile mechanics. In addition, general educational courses, including stenography and typewriting, have been arranged for those who wish to take it.

Work in one or another of these classes is usually prescribed for all patients taking exercise. The patient is not permitted to become fatigued, and as he is constantly under medical supervision, his temperature recorded daily, his weight weekly, and his lungs examined monthly, there is little chance for him to go backward. While no claim is made that this system is the ideal one for restoring a patient to health, yet it does not go to either extreme. It offers a number of advantages over both of those just criticised.

1. No risk is taken while a patient is under treatment of breaking down the tubercle walls by over-exercise. True, it may not harden the muscles of the body as does Paterson's plan of graduated work, but this is no disadvantage, for as far as we can see, the resistance of the patient is restored as quickly and more permanently under this system than under his.

2. It is much more efficacious in bringing a man back to health, and keeping him in a healthy state of mind, than any system where the rest cure is employed to excess. We all know how indolent and listless the majority of patients become when they are subjected, month after month, irrespective of the general condition of health they are in, to prolonged and utter inactivity. No wonder is it that so many patients become hypochondriacs mentally, and soft physically, and relapse so frequently when they return to a normal way of living.

It is the too long continued rest, as practised so extensively in our health resorts, and in a number of our sanatoria, too, which has led to so much criticism and misunderstanding on the general usefulness of these institutions to the country.

Comparative Statistics.

On looking over the reports published by different sanatoria, one cannot help but notice that the immediate results of treatment are

always available. It is very gratifying, no doubt, to see that a large percentage of all patients admitted have been apparently restored to health, or at least, greatly improved before leaving the sanatorium. But the after-discharge results to patients treated in our institutions are not so readily available, and even when available, the data covers so few years that they are of little value for statistical purposes.

Since the ultimate object of sanatorium treatment is to restore the full working capacity of its patients, it is obvious that the efficacy of the treatment is determined by the proportion of the patients recovering their earning capacity and maintaining the same for a reasonable period of time. I have, therefore, selected a number of sanatoria whose post-discharge records are available for study. At the end of 1-10 years the following percentages of their patients are well and working:

Trudeau Sanatorium (1-10 years) 61% of its patients well and working.

Laurentian Sanatorium (1-9 years) 56% of its patients well and working.

Nova Scotia Sanatorium (1-6 years) 73% of its patients well and working.

King Edward VII. Sanatorium (German) (1-5 years) 50% of its patients well and working.

(Combined Results) (1-7 years) 47% of patients well and working.

Brompton Hospital (1-7 years) 44% of its patients well and working.

That is to say, under the best institutional treatment we can give to-day, about 50% of patients in Stage I., and II., and III. can be expected to be restored to health and to enjoy their full working capacity at the end of ten years.

If we consider, however, the after results reported from the Trudeau Sanatorium, Laurentian Sanatorium and the Nova Scotia Sanatorium, we find that of early, or first stage, cases, about 85% to 90% are well and working seven years after discharge.

These results are very gratifying from both an economic and medical standpoint, for as may rightfully be assumed, without such effective and systematic treatment, the large majority of these patients would have died of the disease within three years from the date of its attack.

In spite, however, of the excellent work that is being done in so many of these institutions in America, it has not measured up to the expectations of the public. This disappointment is due to a mis-

understanding of what sanatoria can reasonably be expected to do for those affected with tuberculosis. When we consider that sanatoria are only one of the means employed to combat tuberculosis, and that only a very small percentage of consumptives can gain admittance for treatment, it can readily be seen that standing by themselves, they cannot reduce to any appreciable extent the spread of the disease. The criticism that one hears most frequently, and which appears to me to be justified, is that most of these institutions are not taking in the very cases that are a menace to the community, but are devoting their energies to the treatment of those patients in the earliest stage of the disease, many of whom are even without tubercle bacilli in their secretions. To give elaborate treatment to incipients, and to neglect the menace of advanced cases, is to keep the door wide open for more incipients. No matter whether we adopt the view that all tuberculosis is started early in life, or that it may enter the system at any time, the quantity of infection plays a prominent part in both theories; and the reduction of the spread of infection, is logically the thing called for. There is no conclusive reason why advanced cases should be shut out of our institutions, provided proper hospital care can be given them there. That is to say, every sanatorium should have a separate infirmary building and a sufficient nursing staff for the care of those demanding bed attention, while those needing less care and attention may be housed in pavilions. Thus it would be an easy matter to separate and grade patients to the various units according to their condition and requirements for treatment.

The sanatorium idea itself, however, is not a fault, but the manner in which it is applied. If hygienic living in the open air, under careful medical supervision, with the application of suitable hours of rest and exercise, graduated to the individual wants of the patient, hydrotherapy, tuberculin, artificial pneumothorax, and other measures which are found to be of value in promoting an arrest of the disease, count for anything, then there is no place where such treatment can be so successfully carried on as it is in a well-conducted sanatorium. But the ideal system is to have a plant of such proportion that all patients applying for admission can be received, entering all as infirmary patients for their initial period of observation and rest, then graduating them to the other buildings according to their condition and improvement. This will by no means do away with the need of hospitals for dying consumptives, as they will always be required to look after the poor and homeless of our crowded cities.

THE UTILITY OF ARTIFICIAL PNEUMOTHORAX IN THE TREATMENT OF PHTHISIS

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Artificial pneumothorax is the name for a procedure whereby the collapse of the lung is brought about through the introduction of air, or gas, into the pleural space which lies between the lung and the chest wall, with the object of putting a diseased lung at rest. The lung is of spongy, elastic texture, and is normally in a stretched condition because of atmospheric pressure which can act upon it through the windpipe, bronchial tubes and air spaces, pressing it out to fill the space of the chest cavity. If an entrance for air is made through the chest wall and pleural membrane lining it, and air is allowed to enter freely, the lung will contract until the air pressure is the same both inside and outside the lung. The amount of contraction can be proportioned to the amount of air permitted to enter, and, with the apparatus devised for the procedure, the contraction may be stopped short of complete collapse, or the lung may, to a limited extent, be actually squeezed by increasing the amount of air introduced to a point above atmospheric pressure. It will readily be seen that if there is nothing to prevent the collapse of the lung, a diseased lung may be put at almost absolute rest through being surrounded by a cushion of air which acts as a splint. An inflamed lung can thus be splinted almost as completely as an inflamed joint, and the known benefit of splinting to the joint can also well be imagined for the lung. The circulation in the collapsed lung is thereby greatly limited so that poisonous products in the inflamed tissues are not so freely washed out to come eventually into the blood stream. The poisoning of the body in general is thus reduced and a general improvement, with increased resistance of the body cells, takes place. A reduction in fever is therefore to be expected. The inflamed lung will become less irritable, and cough will be reduced. Expectoration will also be lessened because of subsiding inflammation, quieter circulation and limited movement.

The rest treatment ordinarily applied at certain periods in the treatment of pulmonary tuberculosis can never be so effective as this artificial method of inducing rest, since respiration, even when limited by bodily rest, must be shared by the affected lung.

If this artificial method of securing rest is to be applied, two essential points for its success will readily be understood. The first

consideration is the condition of the better lung, upon which the function of respiration must depend if the diseased lung's function is to be dispensed with. Rarely is the better lung entirely free from disease in the rather advanced type of disease for which this treatment is adapted, and it is sometimes a nice point to decide whether or not the procedure should be undertaken. The better lung must be well enough to stand the strain of extra function. Disease in it will often lessen, mainly because of the improvement in the general condition resulting from the reduced poisoning of the system.

The second point is whether collapse of the lung can take place, since it too frequently happens in cases suitable for the treatment that past inflammation has caused the lung surface to adhere firmly to the chest wall. Fairly accurate opinion as to the possibility of the undertaking may be formed, but opinion is quite frequently at fault and no otherwise suitable case should be denied the attempt because of suspected adherence of the lung to the chest wall.

Collapse treatment is not generally applied to early cases of pulmonary tuberculosis, because the outlook for them is good under usual methods of treatment, and there are reasons for getting along without this treatment, if possible. If a patient is not doing well under properly applied conventional methods of treatment, he should be given an early chance at collapse treatment. If this were done the results of collapse treatment would be far better, good as they already are, with great gain for a large number of patients. The reasons why the method is denied the earlier group of patients are two: there is a slight risk involved in this very simple operation, and complications occasionally arise through the creation of this unnatural condition. Both these objections are inconsiderable, when weighed against the dire outlook for patients who do not promptly improve, or who gradually get worse under the ordinary methods of sanatorium treatment. The operation in itself is trifling, and scarcely to be considered from a surgical standpoint. It is, of course, always done under a local anæsthetic.

Nearly a century has passed since the induction of artificial pneumothorax was conceived and put into practice by Carson, of Liverpool, as a treatment for phthisis. Following the Napoleonic wars it was noted that soldiers known to have been phthisical got better following a bayonet wound of the chest, when air had entered the space between the lung and chest wall. It is more than twenty years since Forlanini, of Padua, and Murphy, of Chicago, independently, made it an effective measure in treatment. Ten years ago it had become widely adopted in Europe, and it has been extensively

practised in America during the past seven years. This treatment was carried out by several physicians in Ontario after Murphy published his method in 1897. Dr. J. M. Rogers, of Ingersoll, was, I believe, the first to practice it in 1898. In 1900 it was almost simultaneously taken up extensively by Dr. James Third of Kingston and Dr. A. MacKinnon of Guelph. Dr. Third read a paper on the subject before the Kingston Medical and Surgical Society in April, 1903. Of fifty-one cases reported, all having had bacilli in the sputum, twenty-seven were living in 1907, nine of them being in good health. In 1918 two of the nine had been killed in France, three were well, and four had been lost track of. Dr. MacKinnon's article, read at the meeting of the Ontario Medical Association in June, 1912, has been published. This contribution marked the renaissance of the procedure in Ontario, and during the last five years it has been used extensively by a few physicians.

Four years ago I had the privilege of reading papers before the Toronto Academy of Medicine and the Ontario Medical Association, in which the method in general was discussed and results on twenty-four cases were reported. My apology for bringing this subject up again at this meeting is the comparatively slight recognition that the method has thus far received from the profession at large. This is evident because of the few cases that present themselves especially for this treatment, and because enquiries from well-informed physicians as to what is meant by artificial pneumothorax are not infrequent. It seems, therefore, probable that this procedure must still be unknown to many physicians.

In the last two years more than 4,000 people have died in Ontario from pulmonary tuberculosis. It has been fairly estimated that at any one time there are 10,000 cases of pulmonary tuberculosis in the province. Upwards of 2,000 die yearly, and are replaced by a similar number of new cases. We may, therefore, assume that during the past two years there have been 12,000 patients for whom this method of treatment might rightly have been considered, if all of them had come under the observation of physicians, and 8,000 of these, at least, who would be moderately or far advanced cases, had the right to have this method considered for the treatment of their condition. An enquiry sent to the several sanatoria and out-patient clinics for tuberculosis in the province, and to physicians who are known to be practicing this method, reveals the fact that at present collapse of the lung has not been attempted in more than 200 patients during the last two years. Therefore, only 2.5% of the moderately and far-advanced consumptives have had the opportunity of being

helped by this beneficient method. It is surely worthy of wider application.

The percentage of patients for whom it is a desirable procedure cannot be accurately estimated. The stages of disease of patients coming under the consideration of the various workers in the field of tuberculosis differ greatly, and the criteria by which the suitability of a case for the treatment is judged have been varied, and are, to a certain extent, experimental. The personal equation of each physician will also modify the selection of cases. According to such limitations the method has been tried in from 5% to 12% by various workers. Thus far I have tried to practice artificial pneumothorax in seventy-three patients, 12% of these who have come under observation since I felt warranted in practicing this treatment. My criteria have been varied, and have been tincturd by conservatism, enthusiasm and humane considerations, and there has inevitably been some bad judgment in selecting cases.

With the yearly mortality of 2,000 from pulmonary tuberculosis in the province of Ontario, it is reasonable to assume that each year 2,000 patients approach and pass the point when pneumothorax should be considered as a therapeutic possibility. If 10% only were selected (and if considered at the proper time the percentage might be considerably higher), the method should be tried in at least 200 cases yearly, apart from the great accumulated reserve of 800 cases (10% of 8,000 above mentioned), to whom it should be applied. From my own hard material, as will be seen later, a more or less beneficial pneumothorax was obtained in 56% of the cases in which it was attempted, and a material success was obtained in 60% of these, apart from benefit symptomatically in many others. Better material should give much greater success. Therefore, material success might be expected in upwards of 250 cases at once if this measure could be applied to the large number for whom it is desirable that are living at present, and one might reasonably expect upwards of 60 successful cases yearly for the future.

In a previous paper I have mentioned the immediate and ultimate results obtained by physicians of large experience, and some of these results have stood the test of years. The symptomatic relief, the prolonging of life, the restoration to health and working capacity, and the arrest of the disease in otherwise hopeless cases obtained by artificial pneumothorax, makes the procedure, when it can be successfully applied, pure gain for the tuberculous who are losing ground. For such patients it has place when sanatorium treatment, with or without graduated exercise, fails, and when tuberculin

is inappropriate. From the abundant literature no one can doubt the value of induced pneumothorax in certain selected cases of tuberculosis. My faith in this treatment is even greater to-day than it was four years ago, when I expressed mild enthusiasm about its possibilities, and I shall prove to you that this faith is justified solely from my own limited experience. Such cases as the following seem sufficient warrant for enthusiasm, and the patients themselves are the warmest advocates of the method.

1. A man aged thirty-eight has had symptoms of a progressive tuberculosis for eighteen months. He is fat and plethoric, the left side of the chest is greatly contracted and there is almost no respiratory movement. The heart's impulse is visible over an area of 14 cm. extent. The point of maximum intensity is 15 cm. to the left of the midsternal line. Dulness is intense except at the extreme base. Cavernous signs are extensive. There is marked hypertrophy of the right lung, and a moderate infiltration of the upper lobe. There is one ounce of sputum per day, with bacilli present. For three months there is some improvement under satatorium treatment. The patient then relapses, with slight daily fever occasionally reaching 102°. The sputum increases to four ounces. There is much pleurisy on the left side, and great mental depression. A tuberculous papilloma develops in the interarytenoid space and is removed. Six months after coming under observation, artificial pneumothorax is, to my surprise, easily induced. A month later the patient is up the greater part of the day, and is better in every respect. Three months later he is exercising freely, and tubercle bacilli are absent from the sputum. The signs in the right lung gradually became less pronounced. The patient left at the end of twenty-one months in excellent physicial condition, and able to undergo considerable exercise. Shortly after leaving, effusion developed in the side. This has been persistent but has given no trouble. The patient resumed his old occupation of electrical engineer a year later, and has remained well at work during the last two and a half years. The compression has been maintained. Fifty-two injections of gas have been given during the five years. Twenty examinations of sputum in three years have been negative for bacilli.

2. A girl aged eighteen had had progressive symptoms for six months before coming under observation. An extensive lesion of moderately intense type involved the left lung throughout. A slight infiltration involved the upper half of the right upper lobe. After improvement for four months there was a severe relapse, with marked constitutional symptoms and general increase of the pulmonary signs.

After four months from the beginning of the relapse, pneumothorax was timidly undertaken because of the increasing signs in the right upper lobe. Improvement was prompt and consistent. For three months physical signs in the right upper interscapular region increased and then subsided. The patient then improved in every way. A year following the induction of pneumothorax there was slight reactivity at the right apex. Treatment was then carried out at her home far away. Five months later she suffered a paratyphoid infection. At this time I found further activation at the right apex. The pneumothorax was lost in about two years and the lung reëxpanded. When last seen, a year ago, the physical signs in both lungs might reasonably be considered those of a healed lesion, the patient was apparently well and enjoying excellent health. This was three years after the original operation, and more than a year following the reëxpansion of the treated lung. This patient leads a normal life, with unlimited exercise. She could earn her own living, and may well be considered an arrested case. She has married recently.

3. A man aged thirty had had symptoms for five months, and, on examination, was shown to have a moderately advanced condition involving the right upper lobe and the apex of the right lower lobe. During a month's observation a cavity devloped and pneumothorax was induced. A satisfactory compression was obtained, the temperature fell to normal within ten days, and marked improvement was forthwith made in every way. Two months later a slight effusion was noted. Treatment was then continued by the patient's own physician. Nine months later the patient returned for examination and refill. The lung had reëxpanded so much that it was almost impossible to determine which lung had been compressed. A slight modification of breath sounds below the clavicle was the only clue. Although the distance was apparently arrested, a refill was undertaken. A pneumothorax was continued for six months longer, when it was abandoned, after being carried on for fourteen months. For three years and a half the patient has been managing his 160-acre farm, and may fairly be considered an arrested case, if not apparently cured.

4. A youth aged nineteen had had symptoms for nine months. A large cavity was found in the left upper lobe, and a widely disseminated lesion throughout that lung. There was a mild disseminated lesion, also, in the right upper lobe and in the apex of the right lower lobe. A year later, under sanatorium treatment, there had been marked improvement both in general and local condition. Nothwithstanding the general improvement, however, the patient was unable to endure excercise or tuberculin. Eighteen months

after coming under observation the improvement in the right lung was so marked that the induction of an artificial pneumothorax seemed warranted. A fair degree of compression was obtained. Sputum was reduced within six weeks from three ounces to half an ounce, and the patient was soon able to undertake more exercise without any rise in temperature. The pneumothorax was maintained for eighteen months, but the gas cavity had become so greatly diminished in size during the last nine months of the treatment that the pneumothorax was abandoned. The patient was then able to take unlimited exercise, physical signs had almost disappeared from the right lung, the left lung was relatively dry, half an ounce of sputum continued from which bacilli have been absent for long periods. The patient was about to resume work, but youth led to indiscretions, and I believe he is not so well as when last seen two years ago. Nevertheless, pneumothorax was material in helping towards more secure health.

5. A girl aged sixteen years had had symptoms for two months, with expectoration for one month. She was then seen in consultation, and a lesion of rather intense type was found in the upper half of the right lung, with a slight infiltration at the left apex. A month later there was increase in physical signs and pneumothorax was urged. This was accomplished without difficulty, and a moderate degree of compression was obtained. A month later fluid was noted. After three months the patient left to continue the treatment under her own physician. When seen six months afterwards there was no sign of fluid. The pneumothorax was maintained for twenty-seven months, but was discontinued fifteen months ago. She had received twenty-nine refills. When seen last, a month ago, there was limited evidence of past disease at the right apex, and the disease could be classed as apparently arrested. There was no sputum. The patient was fit for work, and said she could not feel better than she does.

6. A man aged thirty-seven had had symptoms for eight months. An intense lesion was found throughout the left upper lobe, less intense disease in the left lower lobe and a limited area in the right upper lobe. Under sanatorium treatment, with graduated exercise, he improved remarkably in general condition during eight months. During the next four months there was a decided relapse, with considerable extension of the process in the left lung and slight reactivity of that in the right. A large pneumothorax was readily induced. The patient at once began to improve in constitutional condition, and, during the first nine months after compression was undertaken, the condition in the right lung had become arrested, and the patient was in such excellent condition that he was permitted to resume his work.

This he has consistently followed for two years along with regular golf, sometimes playing thirty-six holes. He still returns at two-monthly intervals for refills.

During five years, ending with the year 1917, an attempt to induce pneumothorax was made upon sixty-three patients, apart from the replacement of fluid by gas in several cases of pleural effusion. The material was difficult from the standpoint of prognosis as well as from an operative standpoint. If the treatment was desirable, the patient was not denied the attempt, even though it seemed improbable that collapse of the lung could be obtained. In the ordinary course of events the outlook was fairly good in 2%, doubtful in 25% and bad in 73% of the series. The patients were classified as 24% moderately advanced, and 76% far advanced. Only 6% were clinically unilateral. All but two had bacilli in the sputum. Tuberculous complications were present in 30%. The object of the operation was curative in 52%, and simply to relieve some distressing symptoms in 48% of the cases. The results of the operations allow the series to be divided into two groups: Group I, Operative failures, 44%; Group II, Satisfactory compressions, 56%. The average length of treatment in Group II was thirteen months. In this group there were 26% of durable successes, 34% of temporary successes, 17% benefited in regard to some group of symptoms. In 6% the treatment threatened to be injurious, and was abandoned on this account. The treatment therefore proved of benefit in 77% of the patients in whom compression could be accomplished. In Group II, 26% of the cases can earn their own living, 11% can do part of a day's work, 37% have lost bacilli from the sputum, and 34% have died. In Group I, those in whom no satisfactory compression could be obtained, 8% can earn their own living, 8% can do part of a day's work, 4% have lost bacilli, and 43% have died. The contrast between the groups will become further emphasised as time elapses.

It is evident that artificial pneumothorax has won an important place amongst the methods of treatment of phthisis. It should be seriously considered whenever there is failure of progressive cases to respond to sanatorium methods after a reasonable trial, regardless of the stage of the disease. The best results will be obtained before the occurrence of extensive adhesions, marked involvment of the opposite lung and irreparable deterioration of general resistance. Every case requires careful study and the weighing of the several factors which make for or against success. The character of disease in the lung in question; the ability of the better lung to bear the strain of the extra work that will be thrown upon it, upon which the site and character of disease in it have an important bearing;

the ability of the heart to stand the strain of extra work, under possibly impaired oxygenation, and when affected by displacement, and the presence of tuberculous complications in other organs—are all points for consideration. A reduced toxæmia will often more than compensate the extra work thrown upon the better lung and heart, with consequent improvement even in risky cases. After collapse of the lung has taken place, it will be occasionally noted that adventitious sounds and breath and voice modification have been transmitted and that the better lung is even better than it seemed to be.

Whether the desired collapse can take place is difficult, indeed often impossible, to decide by most careful physical examination along with the X-ray. Prejudice on this point should not restrain the attempt if the case is otherwise suitable, as it has quite frequently been found that a free pleural space, essential to successful treatment, has been found despite the history and signs suggesting adhesions.

This treatment is so much worth while that at convenient points throughout the province some physician should familiarise himself with the technic and develop judgment as to its application, so that the method may have a much wider use than obtains at present.

For preliminary observation, and for the earlier operations, at least, the various sanatoria would naturally be regarded as possessing the desirable facilities. It is, however, a time-consuming, tedious process to carry out carefully a series of these operations, along with preliminary and subsequent examinations, to which now should be added roentgenological study, and for sanatoria to do much of this work they will require more medical assistance than has hitherto been usually provided. The sanatoria are often undermanned, because they are poor, or because directors do not see the need of, nor appreciate the cost in time of, medical work on patients for whom they think a verandah life is all that is necessary. If physicians in general will realize the possibilities of induced pneumothorax, and will demand it as a therapeutic measure in suitable cases, there is little doubt that sanatorium staffs will be augmented, and in the 1,500 beds in the province, filled with 80% of moderately and far-advanced consumptives, many patients will find their lives made more comfortable and often usefully prolonged by the induction of pneumothorax at the proper time. This treatment offers more to the consumptive in whom it can be carried out than any other measure that has been developed since the inauguration of sanatorium methods, and indeed it will often succeed when well-ordered sanatorium treatment has hopelessly failed.

DIFFERENTIAL DIAGNOSIS OF PULMONARY DISEASES

J. Stuart Pritchard, MD., Battle Creek, Mich.

The clinical differentiation of pulmonary pathology presents one of the most difficult problems that the physician has to solve. The difficulties of diagnosis may be attributed, among others, to the following factors: First, an inadequate knowledge of the fundamental principles of the physiology and anatomy of the lungs. Second, the lack of acquirement of the proper technic to elicit the physical signs and a knowledge of their significance, together with an inadequate appreciation of the value of other diagnostic methods, such as the X-ray and the various laboratory tests, and, finally, the extreme variations in the pathology and symptomatology of pulmonary tubercle, from the time of the initial infection to the appearance of tubercle bacilli in the sputum. In this regard, it is essential to distinguish between tuberculous infection and tuberculous disease. Autopsy reports and tuberculin tests show that the majority of adults have acquired tuberculous infection during some period of their life.

It is important to remember that in the diagnosis of tuberculosis, the lesion in the lung producing the clinical manifestations is usually the result of an extension of the disease from the primary focus. Also, after a longer or shorter interval of time, the pulmonary lesion may become completely encapsulated with the disappearance of symptoms and the restoration of health, and the patient once again is able to resume his normal activities in life. Although, under such circumstances, he is harbouring a lesion to which the term "latent" has been applied, still he is in no sense ill, notwithstanding the physical findings which may be detected. This point deserves special emphasis on account of the unfortunate frequency with which such cases are advised that immediate treatment is necessary. The carrying out of such advice is not only gross injustice to the patient, but frequently may add to the hardships of the immediate members of his family.

The criteria on which to establish a diagnosis of clinical tuberculosis depends on the state of the pulmonary lesion, that is, whether it is in a state of activity or inactivity. In other words, are the bacillary products produced at the site of the lesion, escaping into the circulation and impairing the health of the patient? If such products are being absorbed, the necessity for treatment is apparent. The clinical symptoms arising from this absorption are protein in character, and, at times, may be so slight that they escape detection by our

present methods of investigation. In some instances, an extension of the lesion may be detected without obvious symptoms.

The presence, however, of any extensive amount of foreign or bacterial protein in the circulation causes a chain of symptoms in the organism by which a diagnosis may be established. The interpretation of this symptom complex, in many instances, is difficult, and may lead to more or less confusion in diagnosis.

Many people suffer from a mild tuberculous toxæmia, which they endure over a long period of time, yet these individuals exhibit few, if any, of the more important symptoms of tuberculosis. The reason for this is, the amount of poison absorbed has been at all times limited in amount, and has, therefore, produced an extensive specific immunity. The condition of this particular type of patient may be shown by the citation of the following case:

A.B., male, aged thirty, height 5′ 10″, maximum weight 132 pounds net. After a week's observation, this patient shows that the temperature, pulse and respiration are normal, but that he is extremely nervous and presents a very unstable sympathetic nervous system and vaso motor derangement. He complains of sleeplessness and periods of mental depression, varying with excitability and palpitation. He tires easily, and on fatigue dull aching pains often appear under the shoulder blades or at the base of the lungs. The appetite is, as a rule good, but the digestive system often shows impairment in accordance with the degree of nervous disturbance. The patient is the subject of frequent colds and catarrhal affection.

The physical examination gives the following evidence: Inspection reveals supra and infra-clavicular depressions, more extensive on the left side. The upper thoracic muscles are atrophied and the sterno mastoid, especially on the left side, is prominent and tense. The movement of the upper left chest is not as free as that of the right. Information gained by inspection depends to a great extent on the knowledge of the pathology of tubercle. When we consider the great tendency which a tuberculous lesion has to heal and form scar tissue, we can readily account for the changes found on inspection in this case.

Percussion, in this instance, gives us a little information, as the note over the apex is not unduly altered, on account of the fact that fibrosis is an apex is frequently associated with localised compensatory emphysematous changes in the intervening healthy cells. Such changes tend to disguise the alteration in the percussion note.

With ausculation we elicit only a roughened inspiratory sound over limited portions of the anterior upper left chest, with an interrupted inspiratory murmur over the seat of old pleural involvement at the

base. This basal interrupted inspiratory sound is synchronous with the cardiac impulse, and may be caused by the latter being transmitted along pleural adhesions rendered tense by the inspiratory movement. This observation is based on confirmatory evidence obtained by the X-ray chest stereos, studies in the comparative study of some 700 cases.

No physical examination or investigation of the chest is complete without a careful fluoroscopic observation and stereoroentgen interpretation. This procedure requires a competent, experienced physician, one who is familiar with the science of roentgenology. It is as difficult to interpret chest stereos, as to account for the various signs and sounds obtained on physical examination. Therefore the X-ray findings should not be relied on wholly. In this particular case, the fluoroscope reveals limited diaphragmatic movements at the left base, with a slight deficient illumination of the left apex. The X-ray stereos of the chest reveal an extensive peribronchial thickening throughout the left apex with some limited involvement of the parenchymatous tissue. The left lung-root shadow is enlarged, and dotted with calcareous deposits. These deposits are also found well out in the ramifications of the bronchial tree. Pleuropericardial and diaphragmatic adhesions may be seen marking the result of the previous attack of pleurisy at the left base.

In the bacteriological study of a case, one sputum examination, if negative, gives us little or no information. Three consecutive specimens of morning sputum should be investigated before any definite importance is placed on the result. If the specimens are positive, increase the amount of decolorization, as sometimes errors are made on account of faulty technic. In the case in question, three sputum examinations revealed no tubercle bacilli. The tuberculin tests, when positive, only prove that the patient's cells are sensitised to a specific protein, but the absorption of this may be a thing of the past. If possible, a serological study of the case should be made, including a complement fixation test with tubercle antigen. If a four plus positive reaction is obtained, with proper technic, it is reasonable to suspect the absorption of tuberculous products is in progress at the present time, according to the researches of Miller, Craig and Petroff. In this particular case, the sputum examinations revealed no tubercle bacilli, but the blood gave a four plus reaction when tubercle antigen was used.

We have at length described a careful investigation of the case under consideration, in which there is reason to believe that the patient is suffering from active tuberculosis; yet this patient has a normal temperature and pulse, no tubercle bacilli can be found in the sputum,

no râles or moisture can be elicited on physical examination, and no extensive pulmonary pathology seen on X-ray study. This is the type of case which the general practitioner must try to recognise, and weeks of study may be necessary before labeling the case one of activity. He must decide, by all the means at his disposal, if the patient is suffering from toxic absorption caused by the tuberculous lesion, and if so, he is dealing with a case of active trouble; but the diagnosis should be made only after the physician has formed a chain of evidence long enough to justify such a conclusion. No one link in this chain should be considered separately, but, on the other hand, if we wait for court proof, we are, as a rule, waiting for an open case of pulmonary tuberculosis, which, in the great majority of cases, means extensive pathology.

In the investigation of any case of suspected tubercle, the careful taking of the history gives us, in many instances, more information than any other single procedure, but the securing of data by this method requires tact, persistency and diplomacy. Never use direct interrogation, such as "Has any one in your family ever had tuberculosis?" But enquire if the father, mother, sister or brother, husband or wife ever had pleurisy, pneumonia, typhoid, or lung fever, intercostal neuralgia, bronchitis, spitting of blood or a cough lasting more than two months. The history of childhood infection is of particular importance. If the patient gives a history of typhoid, ascertain if there was an epidemic at the time, were the bowel symptoms present, and was a blood examination made.

Sudden loss of weight in people over fifty, should be considered with reservation, with malignancy or diabetes as a greater possibility.

Physical signs in themselves must be guardedly considered, even when râles are found, but the persistency and localisation of the latter is a very suggestive sign. The diagnosis of active pulmonary tubercle on such signs as roughened inspiration and prolonged expiratory sounds or slight apical retraction, without further evidence, is not justifiable.

In the arrangement of clinical manifestations, the presence of fever requires a careful study, and many conditions may exist which can account for this disturbance, such as thyroid changes, or the presence of focal infection and certain cardiac conditions. A blood culture should be made when in doubt. It is also well to remember that many toxins may cause a chronic bronchitis. The following case may be presented to show the ease with which a serious mistake may be made:

G.C., age thirty-one, farmer, weight 140 pounds, height 5′ 6″, complains of cough for the past ten months; has had some loss of

weight, considerable expectoration, night sweats and an afternoon temperature of 99.8° to 100°. The patient also shows a very unstable nervous system. A physical examination reveals moisture over the upper part of each lung, anteriorly and posteriorly; repeated sputum examinatons revealed no tubercle bacilli; two Wassermann tests gave negative reactions, and, on the strength of these manifestations, a diagnosis of pulmonary tuberculosis was made and treatment instigated accordingly. Six months' rest and hygienic treatment led to no improvement. A further investigation was made, and an oral examination with X-ray films of the teeth revealed an abscess formation in the roots of both upper left anterior molars. After the extraction of these, the patient's condition rapidly improved, and two months later, all symptoms and physical signs had disappeared.

In considering cough as a symptom, the condition of the heart and circulation should be carefully studied, as venous congestion in the respiratory system, caused by circulatory embarrassment, is a common cause of cough. Few patients will admit having expectoration, but if asked to secure a sputum which comes from the back of the throat, they will generally admit the presence of such, and this is frequently from the bronchial tubes.

The time limit necessary to arrive at a diagnosis can not be limited to any specific period. It is often imperative to spend weeks or even months in investigation before giving an opinion. A conservative judgment, formed only after an exhaustive study of the case, would mean the avoidance of some grievous errors. Especially is this true in the differentiation between those persistent physical signs—which are the result of the decent of acute upper respiratory infections—and tubercle. Râles may persist and become localised from other causes than tuberculosis.

It is essential to secure a Wassermann on all suspected cases of tubercle. If we insist on this test as much as we do on a sputum examination, we would avoid many unfortunate mistakes, and would be surprised at the number of reactions obtained.

It is impossible to become proficient in any branch of medicine unless we have first, last and foremost, an adequate knowledge of internal medicine; and, in diagnosing tuberculosis, our first step is to remember that other affections may be the cause of the patient's indisposition, and that he was not created to represent our particular specialty in medicine.

In conclusion, we may state that the differential diagnosis of tubercle depends on our specific knowledge of internal medicine, our conception of physiology and pathology, combined with our ability to interpret the findings of each individual case under consideration.

HELIOTHERAPY BY THE ROLLIER METHOD, AS APPLIED TO SURGICAL TUBERCULOSIS

J. H. Pryor, M.D., Buffalo

Mr. Chairman, Ladies and Gentlemen,—By simply reading a medical paper or talking to an audience, I cannot give a clear conception of the work in heliotherapy, but I find by making a few brief remarks and illustrating them by pictures, a much clearer idea is conveyed of the work and what it means.

All that I shall say about the Rollier treatment relates to the work done at the J. N. Adam Hospital at Perrysburg. That is an institution for the treatment of tuberculosis, established at Perrysburg, about forty-one miles from Buffalo. There we introduced the Rollier method in November, 1914. I had long been thoroughly dissatisfied with the results obtained in the treatment of children with so-called surgical tuberculosis. You will notice I say "so-called surgical tuberculosis," because I say now there are very few cases of thoroughly surgical tuberculosis in the child. Apparently Rollier had also become thoroughly dissatisfied with the results, and he decided to quit his orthopedic treatment and to establish a place in the mountains where he could carry out his own ideas of heliotherapy combined with orthopedic ideas. His results were so wonderful, that at first I could not believe them, but, in 1914, I became convinced that Rollier was telling the truth, and his results were not exaggerated.

We then decided to begin the work, and we selected a few cases among the children. And by the way, we have found those children by the method mentioned by the previous speaker, by going into the homes and examining the contacts or those exposed to tuberculous infection. It was claimed we would not be able to find enough children to fill our institution. We not only filled it within six months, but have never been able to take care of the applicants, and always have a waiting list of about sixty.

In regard to the Rollier treatment—and this I wish to emphasise—the Rollier treatment is not merely heliotherapic; there is far more to it than heliotherapy. Rollier simply introduced a certain method of using heliotherapy, but he combined with it devices for extension, fixation and the treatment of the case under rays, many of which, practically all of which, are absolutely new methods. I want to impress this upon you, because it was a year and a half after we began before we were using the proper appliances devised by Rollier, and

it required a long correspondence with him before we learned how to handle cases of joint disease, what he did with knee cases, ankle cases, and, particularly, spinal cases; and it was actually one year after before we learned how to take care of a spinal case. So that the Rollier treatment is not simply heliotherapy; it is his method of using heliotherapy—which in many ways is new—but combined with it is an enormous amount of detail, and the results which he has achieved cannot be realised until his treatment is properly used.

The institution is 1,650 feet above sea level, but we do not have nearly enough sun for the proper carrying out of the treatment. We would have much better results if we had as much sun as Rollier has in Switzerland, but we make the best of it for this reason, that if you do not attempt the Rollier treatment in the region in which you live, you cannot take care of the poor, and you may as well take the position that you won't treat tuberculosis of the lungs at all, as to say you won't apply the Rollier treatment because you do not have as much sun as in New Mexico or Arizona. In the colder climates you have distinct advantages that they do not have in New Mexico and Arizona, because in the summer we have to be particularly careful in using this treatment that the patients do not become enervated on account of the heat.

We do not always get sufficient sun at Perrysburg to obtain results, but the doctors and nurses are expected to use every hour of sun. One-half hour or one hour of sun a day is not enough to carry on the treatment and make it successful. I am speaking of November and December particularly, because I know that question would be brought up here. In these months we have many dark days and very few days of sunshine. We then employ all the sun we can get, and we use the ultra-violet rays during that period to tide us over, but the patients do not do as well; they go back. That proves what all of you who have had experience have realised that you cannot obtain the same results by the open-air treatment as you can by open-air treatment combined with the sun.

Our buildings are specially designed. They are built in a simple, practical, inexpensive way, and that is the only way to build, because at Perrysburg the child is only inside the building two hours out of the twenty-four. It lives outside and sleeps outside. No child is allowed to sleep in the building, so that you need only a shell where they can come in to eat their meals and go out again.

You must have wind protection. That is absolutely vital to any success in the treatment, and the result is we put up our buildings against the woods. The territory which we own extends over 300

acres, and we rent 250 acres. We have our own farm, supply our own milk so that we can control it, and we have 150 acres of woods. The buildings are put up close to the woods and then enclosed at the ends so that there can be no wind. That gives you a very high percentage of days on which you can employ the sun treatment, which without wind protection, you could not carry out at all.

In regard to the method of exposure, the mistake has been repeatedly made of exposing the lesions to the sun with the idea of causing healing. That is exactly the thing not to do. We never expose the lesion itself until the patient is a chocolate brown. When he is thoroughly tanned, then we expose the place of lesion. If you expose that first, you bring out a decided reaction and sometimes do a great deal of harm.

We begin by exposing the feet and the legs ten minutes the first day; the next day expose the feet and legs twenty minutes, and the thighs ten minutes. Then expose the arms, then gradually the abdomen, then the back, and in the course of about ten days the whole body is exposed to the sun for about twenty minutes or half an hour; the second week up to an hour a day, and in about three weeks we begin to get tan. We have no sunburn. We have had one case, but that was due to the combined stupidity of the nurse and the doctor, and there is nothing that can beat that combination.

We wash the skin carefully; we then bathe it afterwards with spirits of camphor. We find that is the best solution to prevent burn, but sunburn is absolutely unnecessary. We want tanning, not the burn.

When the skin becomes chocolate brown, then the improvement becomes decisive. There is no great general improvement until that time or great local improvement until that time. We must secure the chocolate brown color. That is easy in a very dark person; it is not easy in a blonde or a red-headed, freckled child. If we cannot obtain the perfect chocolate color, they do well after a time with a lighter tanning.

What kind of cases do we take? Every form of tuberculosis no matter what it is—tuberculosis of the eye, of the joints, of the organs of the body, particularly the kidneys. We also take particularly (and these contribute mostly to our cases) tuberculosis of the glands, bones and peritoneal. Most cases are gland cases discovered in homes where parents have tuberculosis, or some member of the family has tuberculosis of the lungs. In the gland cases there are many closed, but altogether too many open, and the result is that we have mixed infection. Ordinarily there is an operation to allow the exit of the pus, or

a few glands are removed with the idea that the disease is abolished, when as a rule the surgeon takes out a few glands and leaves hundreds of thousands behind. We do not operate on the glands. In fact we have no operations on the children in this hospital. We never open an abscess. We aspirate, but in many of the cold abscesses we do not even aspirate it. We wait for the sun to dry it out and in many cases it does dry out. Where necessary we aspirate, but we particularly do not open the gland or make any incision into it, and the pus, unless there is a considerable amount, disappears.

In regard to the bones I am not going to make the claims Rollier does. We have been less fortunate. He claims he obtains results in practically every case with full motion. We have not been able to do that. We have been at times very much surprised, at other times quite amazed at the fact that they do recover with full motion. In the past the endeavour was to obtain ankylosis; our idea is to obtain recovery with full motion, and in a large percentage of cases this can be done with the knee, hip joint, spine and elbow.

A few words about results, and I will show you the pictures. Then, if there is time allowed, I shall be very glad to answer questions, provided I know how.

Gland cases without any exception whatever recover. We have not had a gland case that did not recover. I mean by that the sinus has disappeared.

Of the peritoneal cases, every case has recovered except one. We have had thirty peritoneal and intestinal cases and they have all recovered except one, in which there was no possibility of recovery. It matters not whether the patients have been operated on or not, they recover. The only difference is that where an opening has been made with a discharged sinus, it takes longer to cure it. You have often seen cases of tuberculous peritonitis with enormous extension, where you think that case is going to burst. We have had several of these cases. We had two where the distension was so great that a nurse or doctor was constantly beside that child's bedside to watch it. But Rollier says do not make an incision and do not aspirate, and in both cases the child went on and made recovery without either of these. They come in with diarrhœa and vomiting, with the thin drawn face with which you are so familiar—poor unhappy little things—and in about ten days you will notice that the patient can eat, the symptoms begin to improve, the diarrhœa begins to stop and the abdomen begins to go down, and they gradually but surely recover.

I said we do not operate on those cases, but we did have one exception—one young man—who made very remarkable improvement, his

general condition improved, yet he continued to run a suspicious temperature of 100° and 101° every evening. He was sent to Buffalo to one of the hospitals, and it was found he had two retro-peritoneal abscesses that we could not reach. The operation was made and the young man went on to recovery.

In regard to bones one must be cautious how he reports on those cases. We have now had about 300 cases treated by heliotherapy of all types. We have 150 under treatment all the time by the Rollier method. In some of the bone cases we have not obtained the results we hoped for. The results have been sufficient to make us enthusiastic, but we have not always obtained motion, and at times that has proved disappointing.

We had one case of a girl with that unusual condition of tuberculosis of the cervical vertabræ. She had had a transplantation of bone and another operation. After both these operations, complete paralysis of the legs set in with absolutely no movement for a period of six months. She was brought to us and we placed her under an unusual form of extension, gave her the sun treatment, and at the end of three months she could move her legs; later, throw them about the bed and soon was able to sit up very well indeed and go for a ride. Beyond that we did not gain. She remained about the same. In these cases Rollier claims that one must not expect too much for two years, and to go on hopefully. We will go on hopefully, but I fear that there is trouble with the spinal cord itself, which cannot be removed. Her general condition is enormously improved, and she is a very much changed girl, but we have not got full motion of the legs.

On the other hand we have many cases, very many cases, of complete healing of tuberculosis of the spine with full motion. In cases of gibbosity, we have been using another form of treatment devised by Rollier, and we put the child on a rounded piece of wood, and let him lie directly on it. In some cases we have accomplished nothing; in other cases we make them perfectly straight.

In ankle cases, knee cases and elbow cases, we have had many make complete recovery and with full motion of the joint.

Eye cases I cannot describe accurately because it is surprising how little I know about the eye, but they come there blind with tuberculosis of some part of the eye, and they recover, and recover with full sight. We have had six children with tuberculosis of the eye for whom the specialist said he could do no more, and all of these children have recovered with complete sight. That is not due to the direct action of the sun upon the eye, but the direct action of the sun upon all the skin of the body. The results unquestionably are due to an increased

resistance in some mythical way brought about by the action of the sun upon all the skin of the body, that vast surface, which we have not hitherto employed in our methods of treatment.

Some men ask me what occurs in the skin to bring about that great change, and I can answer that by saying I do not know, and I have never met anybody who did know. Rollier in his last book makes a most elaborate explanation which reads for all the world like some philosophies that give you a headache to-day and you have forgotten all about next week. He gives the theory which brings about the ultimate result, and after you have read it, you come to the conclusion he did not know anything about it. But something happens, and the mistake that we have made, in my opinion, is depending alone upon open air and feeding the child, and forgetting that we have an enormous surface of skin, and by exposing that to the action of the sun we can bring about results we never learned of before.

Already a physician has said to me that in this region with only about 400 feet altitude, they do not obtain and cannot obtain results we do at Perrysburg. I doubt that. I doubt it if it is tried thoroughly and if there is somebody on the job to use all the sun obtainable, because in France they obtain results at sea level, and they obtain results in a country I used to hear of called Germany. Rollier claims it can be obtained at any level if the treatment is properly carried out. There is no doubt at times it is much more disappointing, but if one is to employ the Rollier treatment and expect to get results that approach those of Rollier, he must be an enthusiast, and recognise the fact that we have largely made a failure of the treatment of children with tuberculosis in the past, and with this method we can make tremendous advances.

SECTION IX

MUSEUM LABORATORY

REPORT OF THE MUSEUM AND LABORATORY SECTION

The attractive character of this feature of the Congress, and the fact that, in the extent and thoroughness of detail to which it was carried, it was something of a new departure in the Association's programme, makes a special report in place. The section occupied two large well-lighted rooms on the eleventh floor of the Hotel Connaught, where the large series of pathological specimens and microscopic preparations set out in the museum, and the various laboratory procedures demonstrated, were shown to great advantage. The whole was in charge of Drs. L. R. Hess and W. R. Jaffrey, of Hamilton, and Maude E. Abbott, of Montreal.

Among the museum series, the greatest interest was undoubtedly elicited by the specimens from the C.A.M.C. museum, shown by special permission of Surgeon-General Fotheringham, and under the personal charge of Capt. A. B. Chandler, C.A.M.C. Keen enthusiasm in the examination and study of these, the first war specimens to reach Canada, was displayed not only by the many military surgeons and civilian practitioners who visited the exhibition, but also by a continuous procession of the general public. The exhibit consisted of some thirty-five specimens, showing different types of wounds caused by modern warfare, collected at the casualty clearing stations and base hospitals in France, and sent forward to Canada with a number of others from the Imperial collections housed at the Royal College of Surgeons in London, as the first instalment for a Canadian War Museum. In the series the specimens of intestines showing multiple wounds of entry and exit produced by a single bullet traversing successive coils, and brains showing impact from the opposite side of the cranium, were especially noteworthy. From the point of view of surgical interference the intestinal wounds were also most interesting, for military statistics in the present war show that even

such wounds under modern surgical treatment, when this can be applied early, have a very low mortality, while in previous wars they were nearly always fatal. The value of a Canadian War Museum to the country at large and to the Army Medical Corps in particular, and the wisdom of the military authorities in initiating this, was universally felt, and warm appreciation was expressed on all sides.

The University of Toronto set out a very fine collection of interesting conditions, beautifully mounted under watch-glasses. The special feature of the Western University of London exhibit was the interest of the individual specimens and the carefully detailed history sheet attached to each. From McGill University came three excellent special exhibits, one on animal parasites, one on congenital cardiac disease, and one on diseases of infancy.

In the clinical laboratory part of the section the various demonstrations were set out with elaborately labelled steps of procedure, and a series of highly instructive demonstrations were kept up. Abstracts of some of these have been received, and are subjoined.

1. Dr. A. H. Caulfeild, of the Connaught Laboratory of Toronto, showed experimental prevention and treatment of gas gangrene, similar to that produced in man, in pigeons by inoculating with the B. ærogenes, before, during and after protective doses of antitoxin. The results were striking. An antitoxin for gas gangrene is now a proved fact.

2. Dr. Norman Beal, of London, demonstrated on transfusion, first touching upon the history of this subject and the modern revival of interest in it following Carrel, and discussed the disadvantages of the early methods of Crile and Elsbey in which artery to vein transfusion was done, and which has been abandonded, because it is technically difficult, destroys the artery, and does not enable an accurate estimate of the amount of blood transfused to be made. The use of hirudin had also been abandoned. Sodium citrate, another anticlotting method, was of use in some cases. The methods of passing the blood from the donor's to the patient's vein without adding any chemical are those recommended to-day. Three of these methods were discussed:

(*a*) Syringe method—Lindeman's needles, not generally used now. Still useful in children. Consists in passing blood into the superior longitudinal sinus at posterior part of anterior fontanelle.

(*b*) Percy's method—Tube and illustration shown.

(*c*) Unger's method—Demonstrated.

3. Drs. Luney, Campbell, and Crawford, of the Institute of Public Health, London, Ontario, presented a continuous demonstration of

routine laboratory procedures in Board of Health diagnosis throughout the entire week.

The demonstrations consisted mainly of the bacteriology of tuberculosis, typhoid fever, and diphtheria. Under the section of tuberculosis, besides smears of sputum containing B. tuberculosis, there was on demonstration pure cultures of B. tuberculosis obtained directly from sputum following closely the technic of Petroff. A mounted guinea-pig, which had five weeks previously been inoculated with a positive sputum, showed extensive tuberculous infiltration; at the site of inoculation a characteristic tuberculous ulcer was early found with later involvement of the inguinal and lumbar glands, liver, spleen, lungs, and axillary glands.

The section under typhoid not only demonstrated the agglutination test of Widal, and Gram stained preparations of the organism, but also aimed to show the close morphological resemblances of the colon-typhoid group of organisms and their differentiation by cultural methods, using as media for differentiating, litmus, dextrose agar, litmus lactose agar, litmus saccharose agar, indol broth, and litmus milk.

The section on diphtheria illustrated microscopically the various types of B. diphtheriæ as classified by Wesbrook. Smears prepared directly from the throat of diphtheritic patients stained by Kenyoun's stain were also demonstrated. Numerous other microscopic preparations, including micrococcus meningitidis, micrococcus gonorrhœa, B. influenzæ, the spirillum and fusiform bacillus of Vincent's angina, treponema pallida, diplococcus pneumoniæ, streptococcus hæmolyticus, and others, were demonstrated.

4. Dr. H. K. Detweiler, of the University of Toronto, showed diagnostic features in syphilis as follows:

(*a*) The Wassermann test for syphilis, showing typical, very strongly positive cases, negative cases, and serums from patients showing the effect of treatment. (*b*) The Lange colloidal gold reaction for spinal fluid showing typical paretic and luetic curves. (*c*) The spirochæta pallida, by Levaditi in the india-ink method. (*d*) Wall charts giving summary of the results of Wassermann tests in the wards of the Toronto General Hospital, the out-patient department, and those done in the laboratory of the provincial board of health. (*e*) The technic of the dark field illumination for spirochætes.

5. Dr. W. L. Robinson, of the University of Toronto, demonstrated methods of preparing sections for rapid diagnosis at the time of operation, using a new mounting fluid which greatly improves the result of the staining by polychrome methylene blue.

6. Dr. Davis, of the Municipal Health Laboratories, Toronto, showed an exhibit illustrating:

(*a*) The microscopic appearances of bacteria producing contagious diseases.

(*b*) Outfits supplied free to physicians through seventy-five culture stations scattered throughout the city, diphtheria swabs and culture media, bottles for tuberculous sputum, slides for smears from gonorrhœa and blood smears for Widal, and outfits for blood collection for Wassermann's.

(*c*) Diphtheria and tetanus antitoxins, anti-meningitis serum, typhoid, para-typhoid, smallpox and whooping-cough vaccines, distributed free.

(*d*) Milk examination for bacteria by culture plates; estimation of butter fat by Babcock's test; specific gravity by lactometer; by the dirt test, and tests for preservatives.

7. A continuous demonstration was conducted by Drs. Paul Roth, of Battle Creek, and Maude E. Abbott, of Montreal, on methods of air analysis with especial reference to the demonstration of the CO_2 tension. The following account is received from Dr. Roth:

"Air analysis as an aid to clinical diagnosis is attracting more and more the attention of the clinician.

"The determination of alveolar CO_2 tension by means of the older classical methods is still the most satisfactory one and is comparatively easy.

"The demonstrations included the following:

"(*a*) Methods of collecting alveolar air for analysis: the Plesch-Higgins' method, Haldane's method, and Roth's method.

"(*b*) Methods of analysis of the sample by means of Haldane's and Henderson's apparatus.

"(*c*) Marriott's simple yet sufficiently accurate method for the use of the clinician who is limited to the simplest facilities.

"(*d*) A simple method of detecting more or less quantitatively acetone in expired air by means of the Scott-Wilson solution.

"(*e*) The causes, significance and treatment of acidosis were summed up in several charts.

"Proper equilibrium in the alkalinity of the blood and other body fluids is as essential to normal metabolism as is the regulation of body temperature. The thermometer is the index of the latter, while the alveolar CO_2 tension is generally (though not invariably) an index of the first. In either case the detection of departure from the normal is obviously of great clinical importance."

Resolution

Amongst the important resolutions passed at the meeting the following may be noted:

Moved by Dr. H. B. Small, Ottawa, seconded by Dr. John P. Morton, Hamilton, and unanimously carried,

That whereas the members of the Canadian Medical Association have viewed with admiration the collection of specimens from the C.A.M.C. Museum, which were sent to Hamilton by special permission of Surgeon-General Fotheringham for the Canadian Medical Week, and whereas these war specimens have aroused great interest both among military surgeons, civilian practitioners, and the general public visiting the Congress, and since their further collection and their adequate preservation and development into a great Canadian War Museum must be of the utmost value in the education of the Canadian Army Medical Corps at the present time, as well as a fitting memorial to future generations of the sacrifices of our troops, be it resolved,

That a copy of this statement of appreciation be sent to Surgeon-General Fotheringham, D.G.M.S., with the recommendation that it be forwarded to the Minister Overseas as an expression of the warm support which the development of a Canadian Army Medical Corps Museum received from the members of the Canadian Medical Association.

ADDENDA

THE ROUND TABLE CONFERENCE

THE ETHICS OF COMMERCE*

PROF. G. S. BRETT

Department of Philosophy, University of Toronto

When I was asked to attend this meeting of the Round Table, and, so to speak, prepare a bone of contention for the evening's discussion, I was diffident about my qualifications for the task. When I learned that your secretary was guided in his selection largely, if not entirely, by the fact that I was in no sense a medical man, there was no possibility of denying that I fulfilled that requirement. Accordingly I shall play my part if I say what I want to say about social relations and their meaning: whatever concerns the special life of the medical man can then be more satisfactorily treated by those who have the required experience.

Though ethical questions are often named in books or periodicals, and sometimes treated with serious respect, no one cares to raise such topics outside of a classroom without feeling sure of his audience. This is itself highly significant. For it means that an accepted conventionalism will secure the ethical theorist an uninterrupted hearing, but it will not save him from the ultimate judgment of the so-called "practical" man: for the ethical discourse is usually considered to be very much like the parable which the schoolboy defined as "a heavenly story with no earthly meaning." While I am sure you will not be so unkind as to store up that phrase for use when *this* address is ended, I must take precautions. I shall ask you to bear with me for a few minutes while I remind you of some historical points.

During the middle ages of European history there was a well recognised division between church and state, pope and emperor. What this means for politicians or historians we need not enquire: for the ordinary person it meant the recognition of two forms of life,

*Address delivered at a meeting of the Round Table, Medical Congress, Hamilton (May, 1918).

two systems of conduct, and two kinds of allegiance. On the one side was the kind of life which a priest ought to lead, the "rule" or moral code of the church: on the other side, there was the common life of ordinary men which had in itself little or no moral significance, and only became respectable at stated intervals by means of special rites. Of course I am not intending to assert that individuals could be arranged in these two classes without further trouble: what I mean is that the idea of this division between the heavenly and the earthly, the sacred and profane, the consecrated and the desecrated, was driven deep into the hearts of man. This is not a question of crimes or immorality in the ordinary sense: such things could always be brought under a practical legal code: it is a point of view which may be illustrated by one dogma frequently maintained, namely, that the "state of marriage" as such is always a "state of sin." One of the greatest achievements of the Protestant reform (though this is often overlooked) was the reduction of these abstract notions to more practical views of conduct. For with the Reformation we find a greater tendency toward those formulæ which include as objects of morality not only God and heaven, but also King and country. George Eliot expressed a profound truth when she said, with a fine sense of moral values, "it is better to be worldly than other-worldly."

Without going into more detail, I can, I think, make my point clear. In spite of much progress we still find the old antithesis continually coming to light. Sunday and religion stand together in antagonism with week-days and work: actions can still be regarded as right and admirable, but at the same time it is said such conduct is "not business." This is the new problem which has taken the place of the old: the question before us is whether we can show any real intimate connexion between ethics and commerce. I think we can, but to do that we must certainly make almost as much change in the idea of ethics as in the idea of commerce.

Let us first of all get rid of the foolishness which parades itself in declarations that all business is corrupt. On the other hand, let us abandon the idea that ethics is nothing but talk about irreproachable but also unattainable ideals. We may achieve something perhaps if we restore the good old term "morals," and recall its primary significance: for morals are standards of conduct which arise out of customs (*mores*), and never prefer to be more than the highest types of action which the individual and the community recognise as the marks of the best citizens, at once ideal and human. Then we can begin where the great moralists of the nineteenth century began, namely, with the factors which make a good life possible. Here we shall find

a close and indissoluble connection between ethics and commerce, morals and economics.

Many people still hold and assert that, for "practical" people, life is essentially a free fight, and business in particular a "game of grab." I think those people are really more out of date than they know, and not so much practical as merely superficial. They have a little taint of knowledge and enough acquaintance with evolution to believe that all primitive life is based on robbery. Their ideas are supported usually by reference to certain times when social life was disorganised, and they have this much truth on their side: there have been times and conditions when the predatory instincts had free play, when plunder was the quickest source of wealth, and might alone was right. But these have always been periods of disease, not health: the struggle for life has asserted itself in some kind of cure: failure has dogged every effort to establish such conditions as permanent modes of life: the poison has nourished the antidote in the same soil.

Our theorists, then, are weary; but they are none the less forces to be reckoned with, since their ideas have a subtle charm for many. The predatory instinct is still with us; corruption still has its chance; society still lends its support to the "get-rich-quick" doctrine that "nothing succeeds like success." The fact is that if we live to-day at the beginning of a new civilisation, we certainly live also at the end of an old one. We have our heritage of encumbrances. In the earliest days exchange of goods was most easily accomplished by plunder: the predatory way of living was then most congenial to all but the victims, and it retains its attractions still. When conquest and plunder enriched or ennobled one group of persons, there arose a superior class who delegated the productive work to those whom they either enslaved outright or kept at the end of a string for future use. A fair price then meant simply what you could get for your work: from the prince you got much if he wanted to give it; from the highway robber nothing: but in either case the principles were the same, for neither prince nor robber acknowledged any necessity to render service for service. Gradually through the middle ages and down through modern times a change has been produced: we may omit the details and relate the outcome, namely, that we recognise in some degree that life must become more and more an exchange of services and that our sense of values must be trained to estimate things in this new way.

With this phrase, exchange of services, I reach the limit of my topic. Ethical progress, as indicated by history and by the study of present conditions, is (in one of its aspects) the movement from the

primitive and predatory idea of life to the civilised conception of mutual rights and duties. Much had been done, but that only makes possible still greater achievements. What we want to do is to root out the predatory ideas and plant in their place the conception of mutual responsibility. Our generation is not the first to think of reforms, and we can learn from the past how in fact progress is achieved. For it comes often like a thief in the night. The very life which we condemn and despair of reforming will yield means for its own betterment. Take, for example, the matter of credit. This did not come into being as the invention of theorists nor was it prescribed by a preacher: it grew with the growth of human experience. The man of business will tell you that one of the most important elements in modern trade is credit: and while credit may consist in property or cash, the greatest value attaches to a man's credit when the character is reliable. There you have the right union of ethics and economics, a case of a true moral asset. Such a fact, devoid as it is of all sentiment or theory, stands out like a beacon to show where the right path lies. We have scoffed too hurriedly at the idea that honesty might be the best policy: it ought to be, and we have only ourselves to blame if it is not; the perpetuation of any system in which the honest are punished for their honesty is the most immoral condition imaginable. We have played too long with our mediæval abstractions, such rapid formulæ as "virtue for virtue's sake." We have destroyed the confidence of man in our teaching and guidance because we have given them stones for bread. No progress can be made until we are all convinced that the highest good is really the best thing to have here and now, not a state of affairs for which we require an infinite compensation hereafter. To regain confidence and achieve results we must study and direct those forces which actually operate on man: we must think of influences as literally operating on persons, just as truly affecting their movements as light affects growth or good affects development.

With this idea of forces and their interaction I have introduced a distinctly "scientific" view. You will have seen already that I could have no objection to such a view: a conflict between science and ethics is no longer thinkable, for ethics can only be a science of conduct, a matter of "behaviour" as the biologists say. How much more can be got into it I will not stop to ask: enough for the present that right activity depends on the condition of the organism, and every individual's behaviour is a function of the community. The basis of ethics, then, is the health of the community. That fact we know, but we do not know it fully; we have not exhausted its riches. We have improved sanitation: we have improved the conditions of labour both

as regards positive risks and the character of buildings. In these things the best and the most efficient have proved identical: so far economics has supported ethics. But economic production and efficiency are liable to be dangerous allies: we must not be led astray by a false ideal of industrial growth. Nor must we suppose that our duty ends with the physical welfare of the population. Already there are ample proofs that we shall be carried from external to internal conditions, from individual to racial questions, from health of body to health of mind. And by health of mind must be understood much more than crude questions of insanity, crime and feeble-mindedness. The human race tends to emphasise more and more its own peculiar feature: its *consciousness* becomes more acute and more comprehensive: it cannot, like the animal, merely eat and drink and sleep: while we teach prudence and thrift we are developing, if I may so put it, the organs of worry and anxiety. This too will have its pathology, personal and social, an evil which is far from imaginary, and has its witness in much of the present unrest. All these things must be included in one idea of the "public health," and we must organise for nothing less comprehensive.

My time is more than exhausted, but I should like to add two more remarks. Many people find a standing objection to all real coöperation in the idea of competition. I would recommend to your notice the saying of a very eminent American man of business: we have always room for competition in *quality,* but we have chosen to emphasise *quantity*. In the arts there still remains this competition of quality: we do not praise the man who writes most or paints most, and we do not even assign the highest reward to the greatest quantity. The same idea of values used to be dominant in business, and must be dominant again as conditions become more settled.

Lastly, we all think the war cannot fail to leave some permanent mark on our civilisation. If this expectation is verified, it must surely be so through some form of the conception that ultimately we pay for everything in terms of life. The levelling effect of a war which has touched so many nations and countless individuals must show itself in a greater recognition of this truth. When we realise that not only in battles, but also in the struggle for daily life, every individual has ultimately for his capital the days and hours of his own existence, that this is what he truly gains or spends as he makes life better or worse, that this capital itself transcends all buying or selling because it belongs to another sphere of values—then, I imagine, we shall judge more truly what it means to acquire the fine art of living, and what is the true significance of the ethics of commerce.

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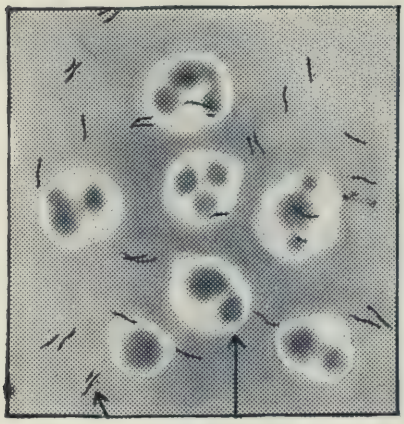

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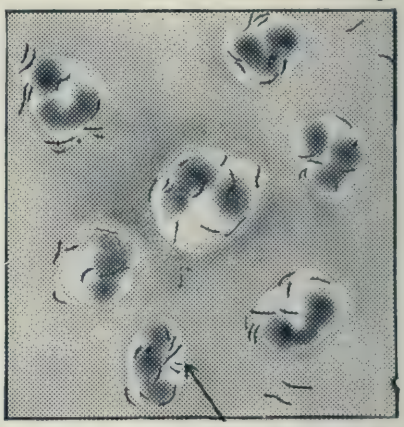

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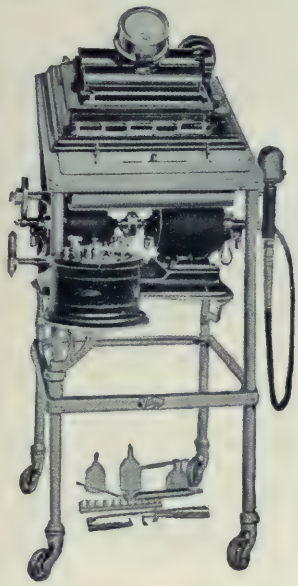

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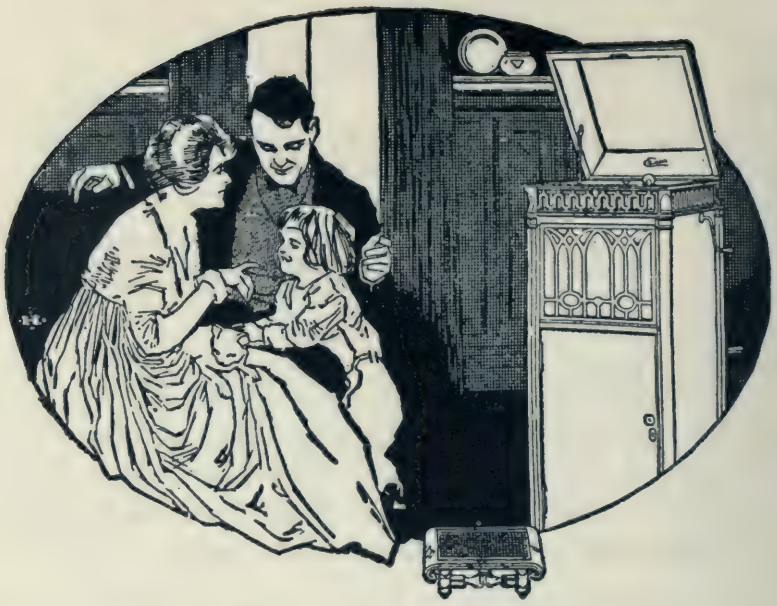

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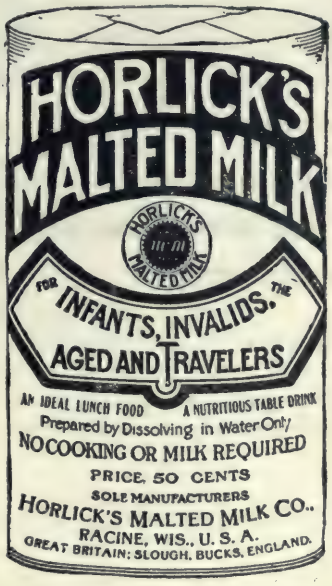

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